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Placenta Praevia—A Study of 174 Cases

BY

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IN the year 1937 the Honorary Medical Staff of the Royal Maternity Hospital, Belfast, decided to allocate the treatment of the 3 common emergencies admitted to the hospital to three members of the visiting staff. To the writer was given the supervision of all cases of antepartum haemorrhage and this paper is a review of the cases of placenta praevia seen during the years 1937 to 1944. Twenty-three cases seen in private consultant practice either as "booked" or "emergency" cases are also included. While the writer has not personally delivered all the cases admitted to hospital their treatment has been carried out under his direction.

Antepartum haemorrhage ranks 4th as a cause of maternal mortality in England and Wales and there are 2 large series of cases of placenta praevia collected by Prof. F. J. Browne[1] and Comyns Berkeley[2] which show the gravity of the condition.

In Browne's series of 3,103 cases the maternal mortality was 5.9 per cent and the foetal mortality 54 per cent. In Berkeley's series of 4,580 cases the figures were 7 per cent and 59 per cent respectively.

In the Royal Maternity Hospital during the years 1932 to 1936, prior to the change of policy described in my opening paragraph, there were 76 cases admitted, with a maternal mortality of 2.6 per cent and a foetal mortality of 51.3 per cent.

In the treatment of my own series 2 main objectives were:—

(1) The reduction of foetal mortality without unfavourably affecting the maternal death-rate.

(2) The preservation of an open mind with regard to the appropriate treatment of a particular case, i.e., that each case should be treated, not necessarily on any "standard" lines, but in accordance with the conditions found.

The latter objective was in contradistinction to that of Stratz[3] who has published a series of 173 cases treated entirely by vaginal methods (rupture of the membranes and bipolar version).

The series referred to, including my own, are summarized in Table I.

I would stress the point that these results are not due to the efforts of any one person but to co-operation by many.

In any case of placenta praevia the attendant who sees the patient first has a great responsibility. He must recognize that, unless in the exceptional event of a serious haemorrhage, the patient should be removed to an institution *without a vaginal*

TABLE I.

F. J. BROWNE	3,103 Cases
Figures collected from 11 teaching hospitals in Great Britain.	
Maternal mortality	5.9 per cent
Foetal mortality	54 per cent
COMYNS BERKELEY	4,580 Cases
Hospitals, Great Britain, Northern Ireland and Eire.	
Maternal mortality	7 per cent
Foetal mortality	59 per cent
(S.B. or died)	
STRATZ	173 Cases
Maternal mortality	0.57 per cent
Foetal mortality	44 per cent
ROYAL MATERNITY HOSPITAL, 1932–36	76 Cases
Maternal mortality	2.6 per cent
Foetal mortality	51.3 per cent
(S.B. or died)	
ROYAL MATERNITY HOSPITAL, 1937–44	174 Cases
(Including 23 private cases.)	
Maternal mortality	0.57 per cent
(1 case)	
Gross foetal mortality	23.5 per cent
(41 cases)	
(S.B. or died)	

examination being made. In this series it is most encouraging to find that in only a few cases had a vaginal examination been made before admission. On admission the patient's blood should be typed and suitable blood made available in case of necessity. Several factors must be considered before deciding on any line of treatment.

These are as follows:

(1) The amount of haemorrhage.

(2) The age, parity and previous obstetric history, with special reference to the size of the babies and the rapidity of labour.

(3) The maturity of the foetus.

(4) The condition of the foetus on admission.

(5) The presence of other obstetric or medical complications.

(6) The type of placenta praevia (only determined when it has been decided that treatment is necessary).

One must decide immediately "Is a vaginal examination necessary?" This decision should be made by someone with experience and not by a resident medical officer. If any real improvement is to be attained co-operation between senior and junior attendants must be enforced at this stage. It is evident from Table II that the number of stillbirths gradually diminished as this policy was increasingly pursued.

It will be noticed that of the 40 deaths which occurred among the babies delivered in the hospital group, 17, i.e. 42 per cent, occurred in the first 2 years. It was during these 2 years that the co-operation between the then senior resident and myself was least satisfactory, many of the cases being examined before I was notified of their admission. The improvement in the later years is largely due to the assistance and co-operation I have received from Capt. Gavin Boyd, Capt. G. A. Craig and Dr. R. A. E. Magee.

There is considerable difference of opinion among authorities regarding the advisability of any vaginal examination in cases of placenta praevia. De Lee[4] states

TABLE II.

Number of Stillbirths in each Year.

	1937	1938	1939	1940	1941	1942	1943	1944	Private
	10	7	7	6	0	4	3	3	1
Percentage	58	43	31.8	29.4	0	17	11.5	16.6	4.3

"Under a good light the vagina is spread with broad specula and the cervix is inspected for erosions, varices, polyps and cancer. *The fingers are passed into the cervix to feel the placenta.*" (The italics are mine.) Munro Kerr[5] advises passing a blunt Hegar's dilator through the cervix and moving it about gently; if bleeding occurs the placenta is praevia. Marshall[6] on the other hand states "I therefore now omit vaginal examination in nearly all those patients whom I intend to deliver by Caesarean section." He further states that the only conditions likely to be missed are carcinoma of the cervix, cervical polyp and ruptured vaginal varix. Can a Caesarean section for a cervical polyp or ruptured varix really be justified?

A vaginal examination should be made in all cases of suspected placenta praevia, but the time at which this examination is made must be carefully chosen.

In the later years of the period under review the attitude adopted has been that *placenta praevia is not an obstetrical emergency which must necessarily be dealt with at the first haemorrhage*, and that a vaginal examination must not be made until the appropriate subsequent treatment can be carried out. There is no objection to passing a speculum and inspecting the cervix but this should be done with great gentleness.

A vaginal examination has been made in every case in this series to determine the type of placenta praevia with which one is dealing and the best method of treatment to employ. It is very easy, but quite unjustifiable, to perform a Caesarean section on every case of placenta praevia without considering all the factors in each case. Many cases are better treated by the vaginal route but it is only on making a vaginal examination that the correct method of treatment can be determined.

One of the main causes of foetal mortality in placenta praevia is prematurity. This mortality can be reduced only by carrying on the pregnancy to as near term as possible. Several patients in this series have remained in hospital for weeks (1 for 14 weeks) and have had up to 9 haemorrhages before any vaginal examination or manipulative treatment was carried out.

The following arguments can be advanced in favour of this attitude:

(1) The rarity of severe initial haemorrhage in cases of placenta praevia. In my experience this complication rarely occurs apart from vaginal manipulation. Admittedly this is a strong argument in favour of eliminating vaginal examination but if the examination is postponed until as near full time as possible and is not made until the patient is on the operating table with everything at hand to proceed if necessary with an immediate Caesarean section the risk is small.

Severe haemorrhage occurred in 3 cases in this series during the vaginal examination, and in 1 just before an arranged Caesarean was to take place. In only 1 of these cases was a blood transfusion necessary and all the mothers and babies survived.

A sudden severe haemorrhage apart from vaginal examination is theoretically possible in a multipara but is rare in primigravida. The number of primigravidae with Type IV placenta praevia, whose pregnancies have proceeded to term before any haemorrhage occurred, is striking.

(2) A certain number of cases have a sharp but not severe initial haemorrhage at 30 to 34 weeks without any further loss. Some weeks later in some of these cases the placenta can be palpated inside the os without provoking any further bleeding. This has been found to be due to infarction of the separated area. In the cases of this type which have been seen the risk of

further haemorrhage seems to be small even in multiparae. Figure 1 illustrates the findings in such a case.

(3) There are a large number of cases of antepartum haemorrhage with a history apparently typical of placenta praevia when the haemorrhage is either not due to a low-lying placenta or due to a degree of placenta praevia which can be safely treated by methods other than Caesarean section. I cannot agree with Marshall's statement that "the history alone enables the junior house surgeon in his first few months of residence to diagnose the condition with almost 100 per cent accuracy." To give but one example of many such cases:

Mrs. C., aged 31, 5th pregnancy. Admitted to the antenatal ward at 35 weeks on account of severe anaemia. The haemoglobin was 25 per cent. She received the usual treatment for such a case including a blood transfusion. While lying in the ward she had a sudden painless haemorrhage at term, losing about 1 pint of blood. She was taken to the theatre with the intention of doing a Caesarean section without delay and without a preliminary vaginal examination.

At the last moment this decision was reconsidered and on vaginal examination the placenta could not be felt. The membranes were ruptured and the baby was delivered spontaneously 2 hours later. The baby was alive and on examination of the placenta and membranes the opening in the membranes was as far away from the edge of the placenta as it could possibly be.

In this series, 81 cases, or 47.6 per cent, were treated at the time of the initial haemorrhage. In the earlier years it was difficult to rid one's mind of Jaggard's dictum "there is no expectant plan of treatment for placenta praevia" but with increasing experience the proportion of those patients who were treated immediately following the first haemorrhage gradually diminished.

From the experience gained over the last 8 years one feels that there is a very definite place for expectant treatment, even after the patient has had several small haemorrhages.

Among these patients there has been nothing to confirm the belief that the recurrent haemorrhages tend to lead up to a catastrophic haemorrhage. Many patients have been under observation for weeks during which numerous small haemorrhages have occurred without causing any serious anxiety. Naturally, if a haemorrhage should occur while the patient is under observation and approaching term, e.g. 38 weeks, treatment is carried out at that stage to avoid the risk of further loss of blood. This attitude has meant that the infant's chance of survival is much enhanced. The additional complication of prematurity is lessened or may even be eliminated. This is borne out by the figures of Table II and also by comparing the weights of babies in the early years of the series with a similar number delivered more recently. In the last 47 cases the average weight of the babies was 6 pounds 12 ounces while the average of the first 47 cases in the series was only 5 pounds 2 ounces. In addition the foetal mortality in the 47 early cases was 47 per cent, whereas in the last 47 cases it was only 6 per cent.

TABLE III.

	Average weight	Mortality
First 47 cases	5 pounds 2 ounces	47 per cent
Last 47 cases	6 pounds 12 ounces	6 per cent

I do know that in the early cases one was alarmed by and treated haemorrhages which, with experience, one would now definitely leave without interference. If one is to judge by these figures there is a very strong argument in favour of expectant treatment, as far as the baby is concerned, and, as the maternal mortality has

not risen, the result appears to be quite justified.

In this series there were 33 primigravidae, representing 18.8 per cent of the total series. Of these only 4 patients were under 36 weeks gestation at the time of delivery. Of the 33 patients 4 had had more than 1 warning haemorrhage and 10 had had one warning haemorrhage. There were 19 cases in which the patient was either admitted and treated for the initial haemorrhage or where the presence of a placenta praevia was unsuspected, the patient having been admitted for the treatment of other complications. Of these 19 cases only 3 patients were under 38 weeks gestation.

Particular mention of 6 primigravidae must be made. In 5 of these no haemorrhage of any kind occurred during pregnancy. The presence of the placenta praevia was not discovered until examination or treatment was instituted for the obstetric complication which had necessitated the patient's admission.

One was a diabetic upon whom a deliberate Caesarean section was being performed at 36 weeks when the placenta was found to occupy a large part of the lower uterine segment. Another case was referred to me on account of a head free above the pelvic brim at 36 weeks. On X-ray examination the foetus appeared to be normal but there was marked extension of the head and neck. When this patient had passed the calculated date the foetal heart-rate increased to an alarming degree, so a Caesarean section was performed. The placenta was covering the internal os and filling the lower uterine segment at operation. This patient had no uterine loss for 3 days following operation during which time she developed a reflex ileus. A cervical dilatation had to be done before the uterus would drain. This unexpected complication (? stenosed os) may have accounted for the absence of any antepartum haemorrhage.

The 3rd case was a primigravida of 33 years, admitted to hospital on account of disproportion. At operation the head was floating above the brim and on incising the lower uterine segment the placenta was divided. The position of the placenta was almost certainly the cause of the apparent disproportion.

The 4th case was admitted on account of pre-eclamptic toxaemia and a free head at 39 weeks. Eleven days after admission the patient was examined vaginally and the cervix was found to be partially effaced and, on passing the finger into the canal, the placenta was felt and a profuse haemorrhage occurred.

The 2 remaining cases were both suffering from pre-eclamptic toxaemia and were admitted to hospital for induction of labour. Prior to the induction one had a small haemorrhage, which was regarded as being accidental in type, but on passing a bougie severe haemorrhage occurred after which the placenta could be felt. The other case was being examined prior to inserting a bougie when the internal os was found to be covered by placenta. I have had a similar experience with a 2-para whom I was inducing for pre-eclamptic toxaemia at term. In this patient there was no history of antepartum haemorrhage, the first haemorrhage occurring when I separated a small area of the placenta which was covering the internal os.

These cases illustrate what is not generally recognized, namely that a placenta can be praevia without causing any haemorrhage until the cervix begins to dilate or until some vaginal manipulation is carried out.

Three primigravidae had a marked intrapartum loss and in these cases the placenta was not felt until the cervix would admit 2 fingers. In one of these cases the head

had been lying deeply in the pelvis for some weeks before labour started. When the cervix would admit 2 fingers the patient had a sharp haemorrhage. On vaginal examination the placenta could be felt but the haemorrhage was controlled by rupture of the membranes. When the cervix was fully dilated a further haemorrhage occurred and the foetal heart-rate fell to 90. Forceps delivery at this stage resulted in a living child. The subsequent history of this patient will be mentioned when dealing with blood transfusion.

My experience of placenta praevia in primigravidae over the last 8 years leads me to believe that, even when the condition is suspected, it is not necessary to keep this type of patient in hospital under close supervision provided she is within reasonable distance of the institution which is prepared to admit her and that she is warned not to permit any vaginal examination before admission. This does not apply to multiparae.

This attitude has been criticized by some of my colleagues on the grounds that it is too dangerous and that one is not justified in arriving at such a conclusion based on 33 cases. The conclusion is not based entirely on 33 cases but on many others seen while resident in various maternity hospitals, and on cases seen in the Royal Maternity Hospital while a member of the Honorary Medical Staff prior to 1937. I would also submit that 33 cases of placenta praevia in primigravidae is a reasonable number for one individual to have seen and from which to arrive at some conclusion. Surely one case out of 33 would have had a severe haemorrhage if this complication was at all frequent.

My critics have not been able to quote any case in which a severe *spontaneous* haemorrhage occurred in a primigravida. The cases they have mentioned have all been examined vaginally and the severe haemorrhage precipitated. Solomons's series of 138 cases without a single blood transfusion being necessary would support this attitude.

In dealing with multiparae the previous obstetric history is most important. A patient with a history of easy rapid deliveries may be successfully treated by vaginal methods which would result in a stillbirth in a patient with a history of difficult or slow labours.

Figures 2 and 3 illustrate this point.

The maturity of the foetus is important but must be viewed in the light of the previous history. It is obvious that the nearer the baby is to full time the better its chances of survival. A full time living foetus would justify the performance of a Caesarean section where a 30 weeks immature foetus would indicate an alternative method of treatment. In a patient with a history of very large babies one would feel justified in interfering at an earlier stage than in a patient in whom the earlier babies were small.

The condition of the foetus following the initial haemorrhage is an important factor in treatment. In dealing with this question one must draw attention to certain anatomical features of the placenta in cases of placenta praevia.

It has long been recognized that a placenta praevia is usually a much larger and thinner placenta than normal. It has also been recognized that there is frequently an eccentric insertion of the umbilical cord. I feel that the importance of this latter fact has been overlooked. I have drawn attention to this in lectures to students for many years but have been able to find only one reference to it published in 1940. Owing to the war this reference is at present unobtainable as it is of Italian origin. I submit that the position of the umbilical cord in relation to the separated area of the placenta is important and accounts for

a certain unavoidable foetal mortality. If the cord is inserted at the lower edge of the placenta where the separation occurs, or, if it has a velamentous insertion in this area, the baby is unlikely to survive and often dies after the initial haemorrhage. (Figure 4.)

My attention was drawn to the importance of this by seeing cases in which the amount of blood lost appeared to be the same and when the cases were treated by the same method, usually version. In one case the baby would be alive and in the other stillborn, the only obvious difference in the cases being the situation of the umbilical cord. Again one sees 2 types of case; one where the haemorrhage has been moderately severe but the foetal heart is undisturbed. This usually means that the cord is either situated centrally or at the edge of the placenta furthest away from the internal os. In the second type of case the haemorrhage may be slight in degree but the foetal heart is either irregular or cannot be heard after the initial haemorrhage. This almost invariably means an insertion of the cord near the internal os or a velamentous insertion in this area with rupture of an umbilical vessel.

This observation has influenced my treatment on many occasions and has made me feel confident in continuing with a vaginal delivery with success, when associated factors might have suggested the advisability of a Caesarean section.

In Table IV the causes of death in 33 babies is set out. It will be seen that, in at least 9 cases, the situation of the cord was directly responsible for the deaths of the foetuses. Figures 5, 6, 6*a*, 7, 7*a*, 8 and 8*a* show actual placentae illustrating the above observation.

In addition there is no condition in obstetrics where one meets with such variety of placentae and the diagrams and photographs (Figures 9 to 14) illustrate some

TABLE IV.

Cause of Death in 33 Babies.

Private	1 low insertion of cord, baby died following haemorrhage.
1937	1 version. Difficulty with after-coming head.
	1 version, as baby small.
	1 baby died after initial haemorrhage.
	3 versions.
	1 velamentous insertion of cord. Willett's forceps.
	2 premature, 1 pound 1 ounce and 3 pounds 10 ounces.
1938	1 Willett's forceps applied Type III. Error of judgment.
	1 version: child could not be resuscitated, although heart beating.
	1 A.R.M. and Willett's forceps.
	1 intrauterine death.
	3 premature.
1939	1 prolapsed cord and version.
	1 version done unnecessarily.
	1 cord inserted at lower edge placenta. Baby died following 5th haemorrhage.
	1 breech, foot extracted.
1940	1 velamentous insertion of cord, one vessel ruptured during A.R.M.
	1 battledore insertion of cord at lower edge of placenta. Willett's forceps applied, and later found to have caught cord. Error of judgment.
	1 following panicky version; some difficulty in delivery of after-coming head.
	2 premature at 28 and 32 weeks.
1942	1 velamentous insertion with rupture of one vein. Version.
	1 death of baby after haemorrhage, cord inserted immediately over separated area of placenta.
	1 child born enveloped in placenta.
	1 premature at 32 weeks.
1943	1 version, low insertion of cord.
1944	1 premature, 3 pounds 4 ounces. 30 weeks. Type III P.P.
	1 premature, 3 pounds 3 ounces. Baby dead on admission.

of the various types of placenta which have been met with in this series.

It is always advisable to X-ray any case of suspected placenta praevia to exclude the possibility of an abnormal foetus. In this series there were 6 cases of foetal abnormalities, i.e., 3.4 per cent. In a series of 943 babies delivered in private practice the incidence of foetal abnormalities incompatible with survival was 0.94 per cent.

In spite of excellent technical assistance radiography has not proved so helpful in this series in deciding the situation of the placenta as some American workers have claimed.

TABLE V.

*Stillbirths Eliminated for Correction.**

1937	1 hydrocephalic.
1939	2 anencephalic. 1 macerated, 1 pound 2 ounces.
1940	1 gastro-enteritis 19 days after delivery.
1943	1 anencephalic. 1 gastro-enteritis.
1944	1 died gastro-enteritis 14 days after delivery. Weighed 8 pounds 10 ounces at delivery.
	(Corrected foetal mortality 19 per cent.)
	In addition to the above abnormalities, there was one mongol and one spina bifida, which survived.
	Incidence of foetal abnormalities 3.4 per cent.

*Seven premature babies under 3 pounds have not been eliminated, as the prematurity was due to placenta praevia.

In passing I would draw attention to the cases eliminated for the correction of the foetal mortality. I have omitted only the foetal abnormalities, one macerated foetus and 3 cases of gastro-enteritis. This is in contradistinction to some other publications in which all babies below a certain weight are eliminated to allow for correction. One recent writer (Morgan[8]) published a series of 130 cases without a maternal death and claims a foetal mortality due to the placenta praevia of 14 per cent. She attains this excellent figure by eliminating 28 cases, 20 of which died from prematurity. I submit that this gives a false impression of the danger to the foetus as the placenta praevia was presumably the cause of the prematurity and therefore of the foetal death.

The associated medical and obstetrical complications in this series have been cardiac disease, diabetes, pre-eclamptic toxaemia, contracted pelvis and a uterine tumour. Some of these complications have a bearing on treatment. The presence of a contracted pelvis or a pelvic tumour would make Caesarean section the method of choice. I have already drawn attention to the danger of an associated pre-eclamptic toxaemia masking the presence of a placenta praevia and the association of the 2 conditions, especially if the toxaemia is progressive, would indicate the necessity for Caesarean section. Cardiac disease has little influence on the line of treatment, this depending on the type of placenta praevia.

TABLE VI.

	Type I	Type II	Type III	Type IV
Numbers	50	37	46	41
Stillbirths	8	10	17	6
Percentages	16	27	37	14.6

In Table VI the distribution of the cases in the various types is laid out. At this stage I would appeal for the removal of the terms "lateral" and "marginal" from obstetric literature. Professor F. J. Browne's[1] classification of placenta praevia has been followed in this series. (Figures 15 and 16.)

The terms "lateral" and "marginal" are not used consistently by medical writers. Browne's classification if adopted universally would ensure uniformity. No case should be regarded as a placenta praevia unless the placenta has been seen or felt in the lower segment. The Royal College of Obstetricians and Gynaecologists

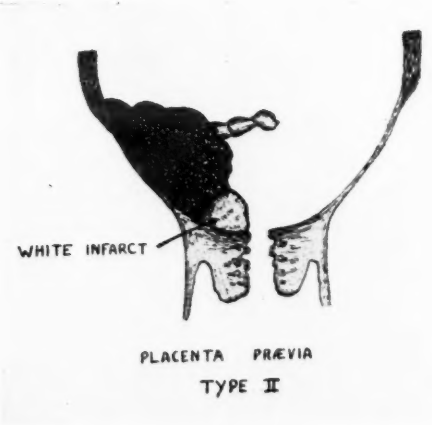


FIG. 1.

Figure 1 illustrates the findings in such a case. A.B., 3rd gravida with sharp haemorrhage at 33 weeks. Expectant treatment for 6 weeks without further haemorrhage. At examination before operation a swelling was felt inside the os without producing any bleeding. The consistence of the swelling was so firm that the possibility of it being a fibroid was considered. At operation the findings were as illustrated. The placenta was smaller and more compact than is usual in placenta praevia and was really acting as a tumour in the lower uterine segment preventing engagement of the head. At her subsequent confinement this patient was delivered *per vias naturales*.

C.H.G.M.

FIG. 2.

This patient had had 3 easy spontaneous deliveries and 1 forceps delivery. Although the placenta and the presence of a vasa praevia were recognized, rupture of the membranes resulted in an easy rapid delivery and a living baby. In this case the baby was born through the gap between the vessel and the edge of the placenta.

FIG. 3.

Mrs. D., 3rd gravida with history of difficult forceps delivery of 8½ pounds babies, developed pre-eclamptic toxaemia of gradually increasing severity with antepartum haemorrhage. Following her 3rd haemorrhage the placenta could be felt on vaginal examination and a Caesarean section was performed. It will be seen that this placenta had both an accidental haemorrhage and a placenta praevia.

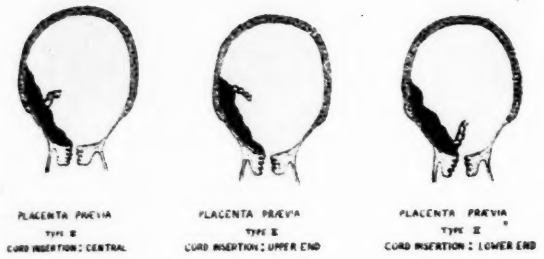


FIG. 4.

FIG. 5.

Type 1 placenta praevia with central insertion of the cord. Baby alive.

FIG. 6.

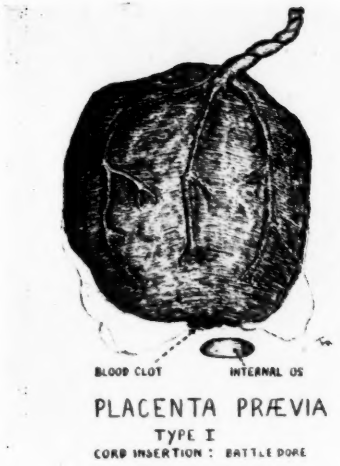


FIG. 6a.

Mrs. T., aged 26, 3-para. Admitted to hospital because of "warning" haemorrhage at 34 weeks. No further haemorrhage; examined at 39 weeks having stayed in hospital for 5 weeks. Placenta could be felt in Type I position. Artificial rupture of membranes performed. Battledore insertion of cord at edge of placenta away from os. Baby alive.

FIG. 7.

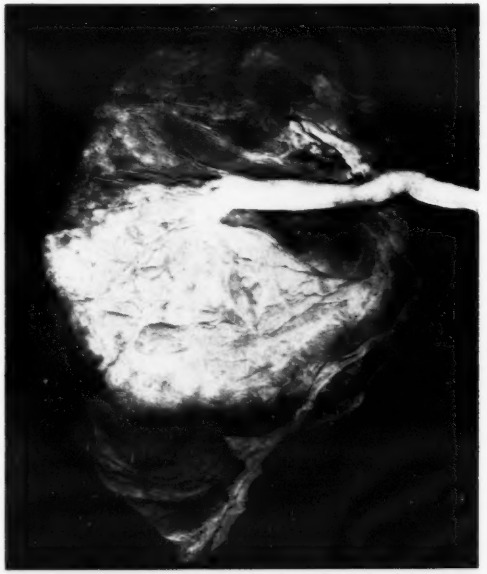


FIG. 7*a*.

Shows a Type II placenta praevia. Fig. 7 shows portion of placenta palpated inside os. Fig. 7*a* the foetal surface of same placenta showing central insertion of cord. Baby alive.

FIG. 8.

Shows maternal surface of Type III placenta praevia. Metal ring represents internal os.

FIG. 8*a*.

Shows foetal surface of same placenta showing the proximity of the cord to the separated area.

Baby stillborn.

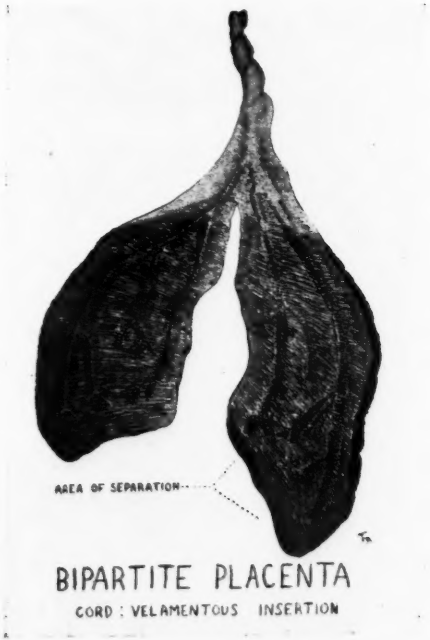


FIG. 9. FIG. 9a.

Photograph and diagram of bilobed placenta. This patient had 3 haemorrhages before delivery. The lobes enveloped the baby, 1 lobe lying in lower uterine segment was partially separated. The area of separation is illustrated in the diagram. There was a velamentous insertion of the cord away from the internal os. Treated by rupture of membranes. Baby alive.

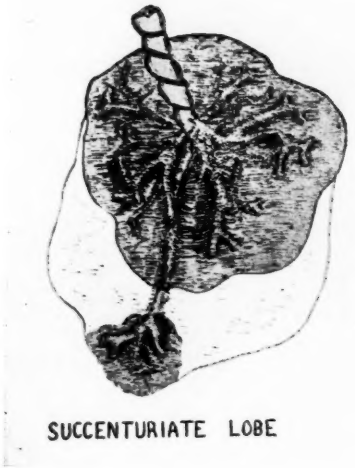


FIG. 10.

Diagram made from specimen showing succenturiate lobe lying in praevia position. Separation of the succenturiate lobe which could be felt inside the os caused the antepartum haemorrhage. Treated by rupture of the membranes.

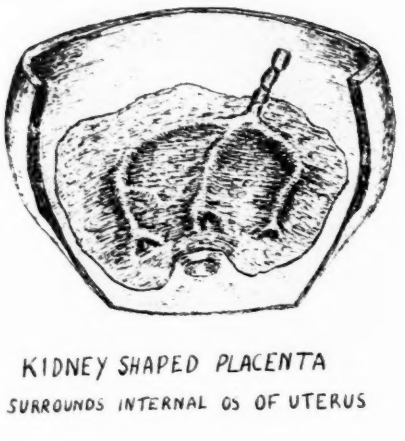


FIG. 11.

Diagram made from specimen. Kidney-shaped placenta occupying lower uterine segment and surrounding half of internal os. Treated by Caesarean section.

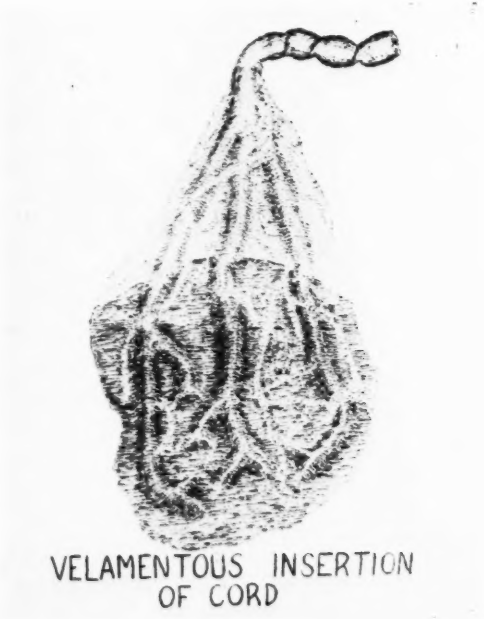


FIG. 12.

Velamentous insertion of cord in case of Type I placenta praevia. Cord inserted away from internal os. Treated by rupture of membranes. Baby alive.

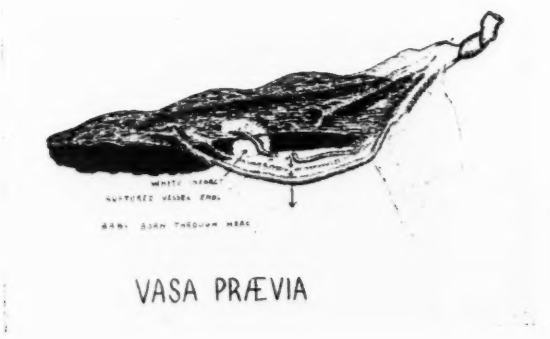


FIG. 13.

Velamentous insertion of cord with vasa praevia. 1 vgs being torn. The baby in this case was alive in spite of being born through gap between the vessels and the placenta. As will be noted from the diagram the torn vessel ran to an area of placental infarction. Unfortunately this vessel was not examined microscopically to see if it was thrombosed. Treated by artificial rupture of membranes.

FIG. 14.

Placenta diffusa. The placentation came down to region of internal os. This patient had several small haemorrhages and a postpartum haemorrhage. Spontaneous rupture of membranes; baby alive.

FIG. 15.

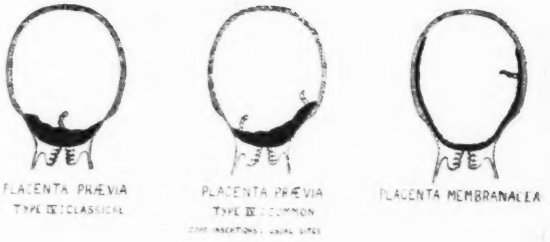


FIG. 16.

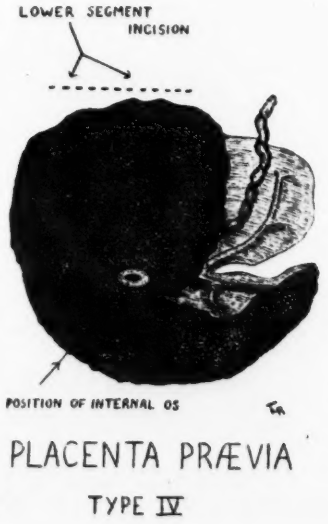


FIG. 17.

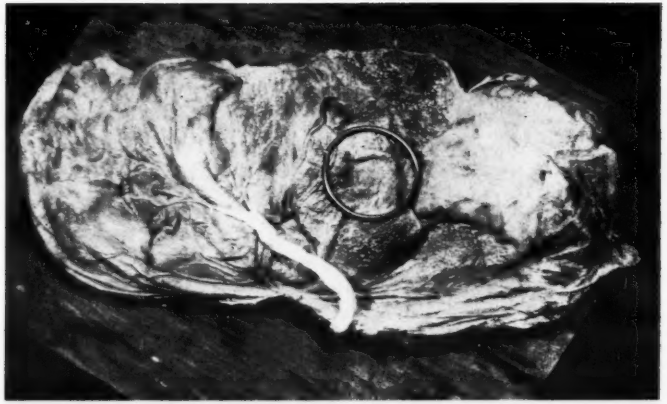


FIG. 17*a*.

Type IV placenta praevia showing position and anatomy of placenta. The incision in the lower segment was just above the edge of the placenta. Trilobed placenta.

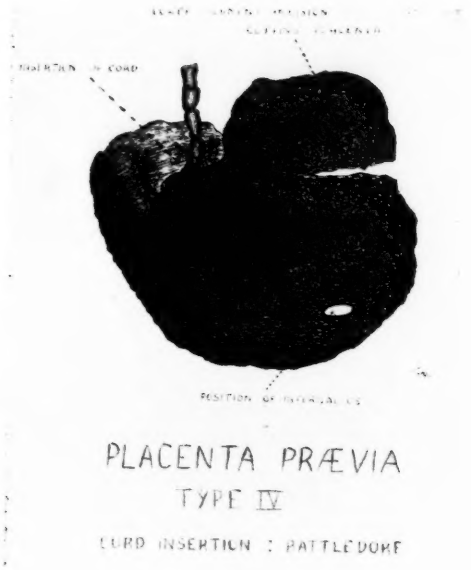


FIG. 18.

FIG. 18*a*.

Shows Type IV placenta praevia with situation of incision in lower uterine segment. The incision passed through the placenta. There is also a battledore insertion of the cord.

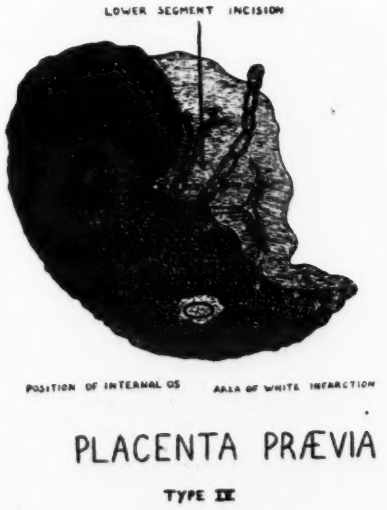


FIG. 19.

FIG. 19*a*.

Type IV placenta praevia showing site of incision in lower uterine segment which was really below level of upper edge of placenta but avoided the placenta because of the anatomy illustrated.

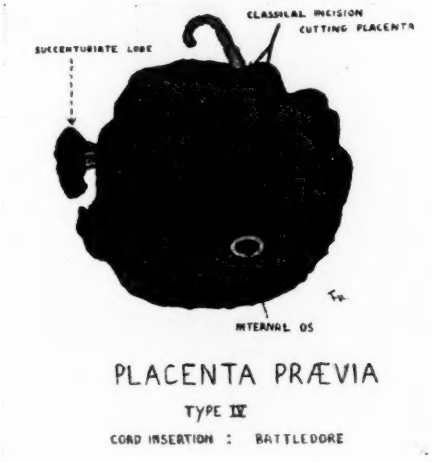


FIG. 20.

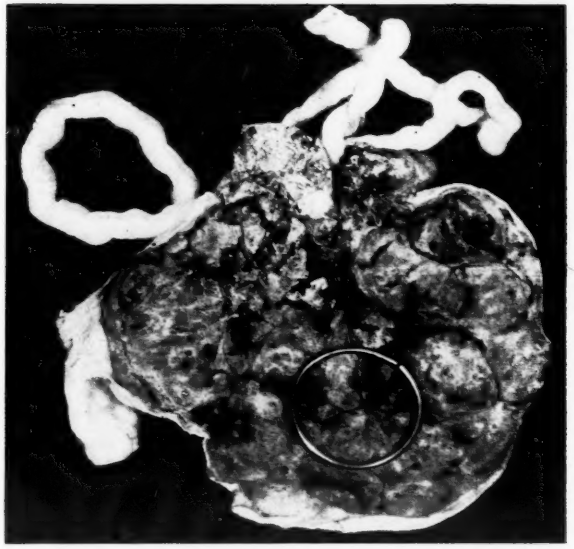


FIG. 20*a*.

Type IV placenta praevia dealt with by the classical operation. The upper part of the placenta was involved by the incision.

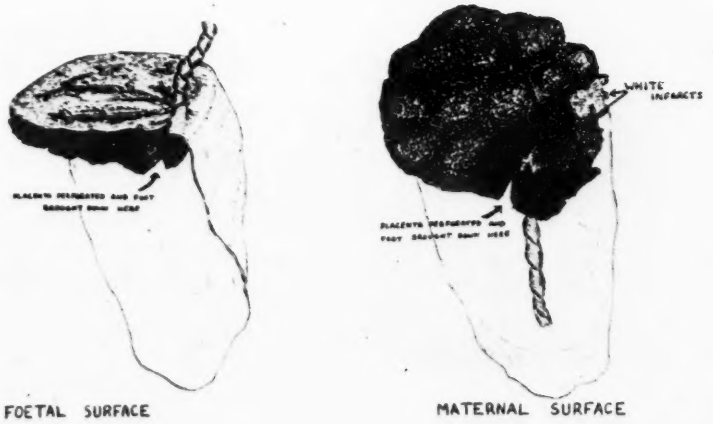


FIG. 21.

FIG. 22.

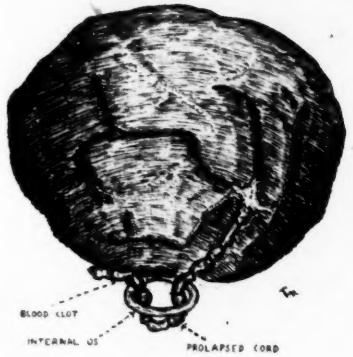
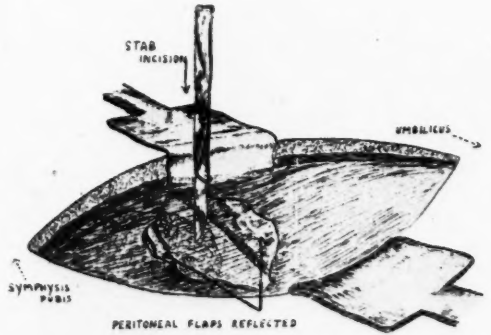


FIG. 22*a*.

Mrs. C., 2nd gravida. Antepartum haemorrhage at 24th, 28th, 29th and 34th weeks. Expectant treatment for 6 weeks during which there was no further haemorrhage. Vaginal examination at 40 weeks, felt placenta but decided to rupture membranes. Following this the cord presented and a lower segment Caesarean section was performed. Baby alive.



LOWER SEGMENT SECTION
PLACENTA PRÆVIA
STAB INCISION

C.H.G.M.

FIG. 23.

LOWER SEGMENT SECTION
VERTICAL STAB INCISION

FIG. 23a.

INCISION
LOWER SEGMENT SECTION
INCISION CUTTING THROUGH CORD

FIG. 24.

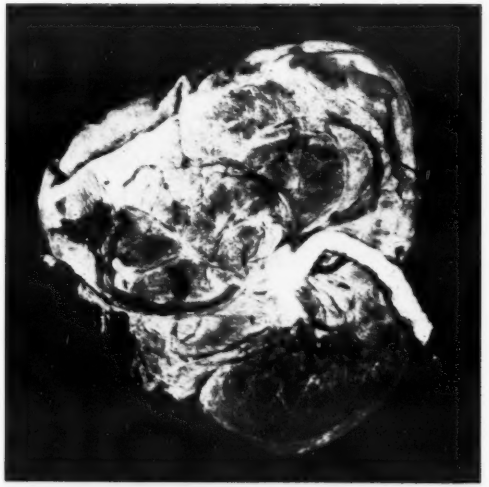


FIG. 25.

Type IV placenta praevia with edges of incision in placenta approximated.

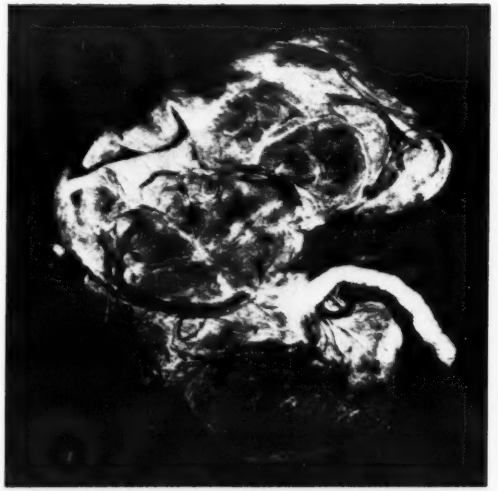


FIG. 25*a*.

Same placenta showing where incision in lower segment involved the placenta in the region of the umbilical cord severing the large umbilical vessel.

FIG. 26.

Case of Type IV placenta praevia delivered spontaneously. ("No treatment" case" Table VIII.)

might consider the adoption of this classification so that published results could be more accurately correlated. The cases which should be excluded in the correction of foetal mortality figures might also with advantage be considered by the College.

I cannot agree that Type IV, as stated by Browne, is "comparatively rare." The classical example illustrated in all textbooks and in Figure 16 is undoubtedly rare. The findings at operation seldom conform to the classical illustration.

4 years there were 38 cases of Types II and III in the hospital group. In these cases 15 versions were performed. In the last 4 years there were 34 cases belonging to Types II and III but there were only 4 versions performed and 19 Caesarean sections. The foetal mortality in this group of 34 cases was 17.6 per cent as compared with 52.6 per cent in the earlier group.

Table VII shows the methods of treatment according to type.

The method of treatment depends ulti-

TABLE VII.

Method of Treatment According to Type of Placenta Praevia.

Type	A.R.M.*	A.R.M.* and Willett's Forceps	Caesarean section	Version	Breech	Nil
I	38	2	2	1	3	4
II	13	6	8	7	1	2
III	1	9	21	14	1	—
IV	—	2	37	—	1	1

* Artificial rupture of membranes.

The placenta praevia situated in the so-called "central" position is subject to the various anatomical variations already mentioned. The umbilical cord is rarely situated centrally and the placenta is never solely confined to the lower uterine segment, frequently spreading anteriorly or posteriorly to the upper segment. Type IV placenta praevia could be more accurately defined as one where, following a haemorrhage necessitating treatment, the placenta is found completely covering the internal os and the edge cannot be reached by the examining finger. Figures 17, 18, 19, 20 and 20*a*, which are photographs and diagrams of specimens where the placenta occupied a large part of the lower uterine segment (Type IV), illustrate the usual findings at operation.

In Table VI it will be noticed that Types II and III are associated with the highest foetal mortality. This is largely due to the fact than in the early years many of these cases were treated by version. In the first

mately on the findings on vaginal examination. As mentioned earlier this examination should be postponed to as near term as possible and then carried out on the operating table, with everything prepared to perform Caesarean section if necessary.

In Type I placenta praevia artificial rupture of the membranes is usually sufficient to control the haemorrhage. The 2 Caesarean sections performed in this group were in elderly patients, one, a primigravida with severe toxaemia and the other, a 3rd gravida who had had an extensive vaginal repair following a difficult confinement 10 years previously.

Version should be reserved for controlling severe haemorrhage when the foetus is immature or is already dead. It might be used as a method of treatment when the baby is full time and alive in a multipara with a history of very rapid deliveries, especially if the foetal heart has been undisturbed by the haemorrhage.

The performance of version should be

unhurried but expeditious, and endeavour made to avoid entangling the cord. The anaesthetic required for this operation should be one which gives a considerable degree of uterine relaxation. Therefore chloroform or ether should be used. After the version has been completed the baby should not be extracted but the delivery left to the uterine contractions. The delivery should be carried out under gas and oxygen with small quantities of ether with the object of giving the foetus the maximum of oxygen. In spite of every precaution this method of treatment is associated with a high foetal mortality-rate. Figure 21 illustrates a common cause of foetal death in a case of Type III treated by version.

Cases of Type II situated on the anterior uterine wall can usually be treated by artificial rupture of the membranes. On the other hand a Type II situated posteriorly is more safely dealt with by Caesarean section. Figures 22 and 22a illustrate such a case.

From Table VIII it is obvious that Caesarean section gives the best results for the baby and is certainly the safest method

TABLE VIII.

Methods of Treatment.

	No. of cases	Still-births or died	Per cent
Artificial rupture of membranes	52	7	13·4
A.R.M. and Willett's forceps	19	9	47·4
Version	22	17	77·3
Caesarean section	68	2	2·9
Breech	6	5	83·3
None (Figure 26)	7	1	14·3

The one maternal death followed a Caesarean section, and was due to a staphylococcal septicaemia; a maternal mortality-rate for Caesarean section of 1.49 per cent.

of treatment in cases of Type IV and most cases of Type III. There are certain details of the operation which seem to be of importance.

Before commencing the operation it is advisable to see if one can locate the position of the placenta in relation to the anterior abdominal wall. If the placenta lies anterior and the presentation is a vertex it will be difficult to feel the presenting part not only on vaginal examination but also on palpating the abdomen above the symphysis pubis. While a placenta lying anteriorly makes little difference to the type of operation it does make some difference to the method of making the incision in the lower uterine segment.

The choice of anaesthetic is important. It should be one which causes the minimal amount of uterine relaxation, thereby reducing the amount of blood lost, and should provide a good oxygen supply for the baby. Therefore chloroform should not be used. The anaesthetic of preference would be gas and oxygen with minimal quantities of ether, or cyclopropane and oxygen. For premedication the patient receives 1/150 gr. scopolamine $1\frac{1}{2}$ hours before operation. Spinal anaesthesia should not be considered owing to the unexplained idiosyncrasies met with in pregnant women. I consider local anaesthesia too great a mental strain for the patient and it does not permit rapid operating which is so often necessary in the presence of haemorrhage.

As regards the type of operation I prefer the lower uterine segment to the classical operation. In any future pregnancy, if it is decided to allow the patient to have a delivery *per vias naturales* there is less risk of rupture of the scar. In addition the convalescence following the lower segment operation is much smoother for the patient. I perform the classical operation only when the lower uterine segment

is so poorly developed that it makes the approach difficult. This is very exceptional as I have found that in most cases the lower uterine segment is more than usually well developed for women not in labour.

Recently there has been considerable discussion on this subject in the British Medical Journal.[9] I think the position regarding the type of operation to be performed can be compared to that of total and subtotal hysterectomy. It has been stated that the subtotal operation is the operation for the inexperienced gynaecologist, but even the experienced gynaecologist may occasionally be placed in the position of finding that a subtotal hysterectomy is safer for the patient. As experience increases one finds that the lower segment section is the operation of preference but on some occasions it is safer to perform the classical operation.

In this series the attitude mentioned at the beginning of the paper, " that each case should be treated individually in accordance with the conditions found " has been followed, but the majority of Caesarean sections performed, especially in the later years, have been of the lower segment type. Of the 68 Caesarean sections performed 47 were of the lower segment type and 21 were classical. Most of the classical operations were performed at the beginning of the series.

If it is suspected that the placenta is lying anteriorly the incision should be started as a careful but not deep stab in the lower uterine segment. (Figures 23 and 23*a*.)

This will cause a small separation of the underlying placenta and allow the finger to be introduced into the uterine cavity. This facilitates the rapid enlargement of the uterine wound and thus the child can be extracted with the minimum of delay even if further separation of the placenta should occur. If the incision is started as a transverse cut one is working in a gradually deepening pool of blood which adds greatly to the difficulties.

While the lower segment operation is preferable there is one danger associated with it and this has to do with the insertion of the cord. If the umbilical cord is attached to the anterior edge of the placenta it is in close proximity to the incision in the lower uterine segment and may be divided or pulled off. (Figure 24.)

Both of these accidents have occurred in this series fortunately without causing a foetal death although one child required a blood transfusion. Figures 25 and 25a show the placenta from such a case.

The danger of postpartum haemorrhage following a lower segment operation for placenta praevia seems to be exaggerated. As soon as the child is delivered 0.25 mg. ergometrine and 1 c.cm. pitocin are injected into the uterine wall and the placenta is not removed until the incision in the uterine wall has been partially sutured. This combined with efficient anaesthesia reduces the amount of haemorrhage to a degree very little in excess of that seen at any Caesarean section but one has to remember that these patients have lost blood before operation. In the whole series there were 22 blood transfusions given and of these 13 were required with Caesarean sections. (Figure 26.)

While blood transfusion is a life-saving procedure it is advisable, especially in patients like mine of Irish extraction with the likelihood of multiparity, to save blood rather than have to replace it. This is borne out by 1 case, a primigravida mentioned earlier in the paper. This patient had a sharp intrapartum haemorrhage and was anaemic after delivery. At her 2nd confinement she also had a Type I placenta praevia with intrapartum loss. Her 3rd baby had icterus gravis at birth which was rapidly followed by acute haemolysis with ascites and death on the 2nd day. It was

recognized clinically and serologically that the condition was erythroblastosis foetalis. The mother was Rh negative. Had she required a transfusion at the 1st confinement Rh positive blood would very probably have been given. In that case her 2nd baby might have shown signs of erythroblastosis.

In the past few years there have been a number of individual series of cases of placenta praevia published. Daily,[10] 139 cases, Stratz,[3] 173 cases, Morgan,[8] 130 cases and this series of 174 cases. These various series total 616 cases with 2 maternal deaths, a maternal death-rate of 0.32 per cent, or 3.2 per 1,000.

This compares favourably with the figures given in Table I and not unfavourably with the general maternal mortality-rate for 1942 of 2.5 per 1,000 in England and Wales. Neither of the maternal deaths was due to haemorrhage. In the Stratz series the 1 death resulted from a pulmonary embolus and in my own series from a staphylococcal septicaemia. It would appear, therefore, that a patient with a placenta praevia dealt with efficiently and in suitable surroundings where a blood transfusion is available should not die from haemorrhage.

The after-care of the baby is of vital importance and I am indebted to Dr. Allen and his nursing staff for their interest in and care of these babies. Many of them were premature, some of them showed signs of mild shock and some were anaemic. That they may be susceptible to infection is shown by the occurrence among them of 3 cases of gastro-enteritis.

In conclusion I wish to express my thanks to Professor C. G. Lowry and Mr. H. L. Hardy Greer for the facilities they have given me in the treatment of these cases.

My thanks are due to Dr. T. M. Roulston, Junior Obstetric Tutor, Royal Maternity Hospital, Belfast, not only for the diagrams which he so carefully prepared for me but also for his help in checking the statistics.

Mr. R. M. Leman, Radiographer, Royal Victoria Hospital, Belfast, has on many occasions endeavoured to demonstrate the placenta radiographically. I am much indebted for his enthusiastic co-operation. To Mr. David Mahaffy I am also indebted for his care in the preparation of the photographs.

Lastly, but not of least importance, I must pay tribute to all those patients who have stayed in hospital or nursing home without question, some for many weeks, and in this way have largely contributed to the results presented. As Wilfred Trotter[11] has said: "Let us not forget that they. . . . have borne more substantial witness than has yet been produced by any philosopher or any theologian that all suffering is not in vain."

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The Influence of Minor Degrees of Failure of Fusion of the Müllerian Ducts on Pregnancy and Labour

BY

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THE human uterus is designed to meet the needs of a species which reproduces 1 offspring at a time. Such an organ is incapable of bringing a large number of offspring to maturity at the same time. This type of uterus results from the fusion of the 2 Müllerian ducts. Animals which have litters have a different type of uterus in which the 2 ducts do not fuse except at their lower ends. This type of uterus can successfully bring to term a large number of offspring at the same time. The former is evolved from the latter. Occasionally failure of fusion of the Müllerian ducts occurs in the human and may be of varying degree, although most commonly it is slight.

The congenital deformities which result may arise in 3 different ways: failure of fusion; persistence of the medial walls; and failure of development. The 3rd, which results in such rarities as uterus unicornis, does not fall within the scope of this paper. The 2nd results in uterus septus and uterus subseptus; with the latter we are concerned here. In the group of failures of fusion it is the level at which fusion stops that determines the type of deformity. In the past the term uterus bicornis unicollis or bicornute uterus has been applied to 2 distinct types of deformity. In the 1st, fusion is complete up to those parts of the ducts which are destined to become the uterine cornua. Thus we have a uterus which is split at its fundus and has two cornua separated by a cleft, but it has only one body and one cervix. This is shown in Plate 1a which is a photograph of such a uterus immediately after lower segment Caesarean section; this is also represented in Figure 2. This uterus is more correctly described as uterus bicornis unicorpus unicollis. Figure 3 shows a fusion failure at a lower level, namely at the upper limit of the isthmus. Here there are two uterine bodies showing wider separation and one cervix. Most authors again class this as uterus bicornis unicollis, but I think a more correct denomination is uterus bicorpus unicollis. Figure 4 shows a fusion failure below the level of the cervix which, to be brought into line with this classification, should be termed uterus bicorpus bicollis.

There are good clinical grounds for this classification and for differentiating between the uterus of Figure 2 and that of Figure 3, as they behave differently in pregnancy and labour. It is the septum bulging into a single uterine cavity as in Figures 2 and 5 that is responsible for the abnormalities seen in these cases. In Figures 3, 4 and 6 there are two uterine cavities, and such abnormalities as are seen in these cases are different from those to be discussed here. Types 3, 4 and 6 are gross deformities and are rarely seen, but types 1, 2 and 5 are more common. Uterus arcuatus (Fig. 1) is usually illustrated as having a slight bulge in the uterine cavity but I think this is really a very minor degree of

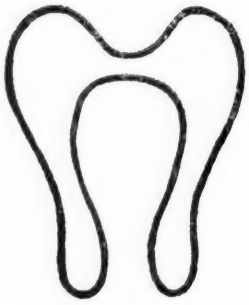

FIG. 1
Uterus Arcuatus

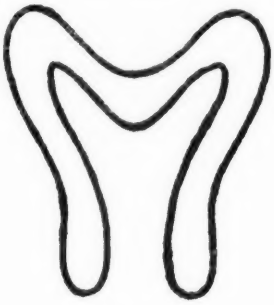

FIG. 2
Uterus Bicornis Unicorpus Unicollis

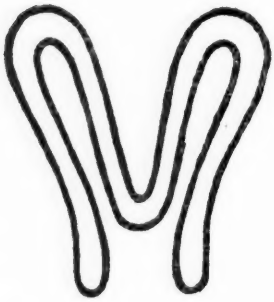

FIG. 3
Uterus Bicorpus Unicollus

FIG. 4
Uterus Bicorpus Bicollis

FIG. 5
Uterus Subseptus

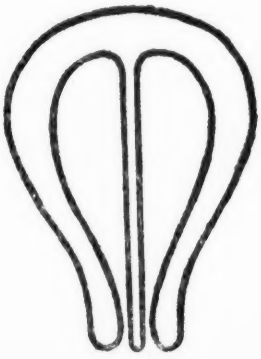

FIG. 6
Uterus Septus

uterus bicornis unicorpus unicollis. While I was collecting material for this paper I encountered 5 cases of the uterus illustrated in Figure 1. The deformity was either felt quite clearly or seen at Caesarean section but the cavity was normal. This was confirmed radiologically. Figure 1 may therefore be regarded as the true uterus arcuatus, and it will be seen that the whole depth of the myometrium is not involved by the deformity. There were no abnormalities in pregnancy or labour in these 5 cases. We may therefore summarize these deformities as follows: (1) Uterus arcuatus; (2) Uterus bicornis unicorpus unicollis; (3) Uterus bicorpus unicollis; (4) Uterus bicorpus bicollis; (5) Uterus subseptus; (6) Uterus septus.

Types 1, 2 and 5 may be regarded as minor deformities and are probably much commoner than is generally imagined. Since the last 2 produce abnormalities in pregnancy and labour their recognition is of importance. The remaining types are more severe in their deformity and are very much rarer. In the last 7 years in Newcastle there have been approximately 18,000 admissions to the maternity department and 10,000 to the gynaecological department. From this material I can find 1 case of Type 6, 3 of Type 3 and 2 of Type 4, and the abnormalities of pregnancy in labour in the 4 pregnant women did not follow the same pattern as those seen in Types 2 and 5. Of these latter types I was able to see more examples in a smaller number of cases admitted during the time that I have studied this problem. None of the deformities were recognized outside hospital, and indeed I failed to recognize one in the 1st pregnancy of the 1st case described. As soon as I became aware of their significance I recognized the deformities with greater frequency. It is with Types 2 and 5 that I wish to deal here. In 10 pregnant patients there were 5 cases of uterus subseptus and 5 of the uterus bicornis unicorpus unicollis. In 2 other patients investigated in the gynaecological department 1 had a uterus bicornis unicorpus unicollis and the other has been investigated radiologically only and only the shape of the cavity is known. It is therefore impossible to classify it accurately. In addition there are the 5 cases of uterus arcuatus which, because they do not deviate from the normal in pregnancy, are not considered further. These 10 cases occurred in a total of 3,894 deliveries. This is an incidence of 1 in 389. This figure is too high, as 8 of them were admitted on account of an abnormal pregnancy or labour and in each case the uterine deformity was responsible for the abnormality which caused them to be admitted to hospital. There was, thus, a great degree of selection. Two, however, occurred in booked patients—an incidence of 1 in 1,223. It is obvious from a study of these cases that the effects of this deformity are but little recognized and also that such effects are serious for both mother and child.

CASE 1.

Pregnancy 1. Admitted late in labour with transverse lie and prolapsed arm. Uterus in tonic contraction. Decapitation. Deformity not recognized. Female child.

Pregnancy 2. Attended antenatal clinic. At 36 weeks, transverse lie with small antepartum haemorrhage; central placenta praevia; lower segment Caesarean section. Living female child; deformity recognized. Uterus subseptus, peritoneal surface of uterus normal.

Pregnancy 3. Attended antenatal clinic. At 36 weeks, transverse lie; lower segment Caesarean section at term. Living female child; placenta low on anterior wall but not encroaching on the lower segment.

CASE 2.

Pregnancy 1. External cephalic version from breech and transverse twice during pregnancy.

Premature labour at 35 weeks. Living female child; breech presentation. Weight of child 6 pounds. Deformity not recognized.

Pregnancy 2. External cephalic version twice in pregnancy. Referred to hospital in labour because of transverse lie. Os 1 finger; umbilical cord presenting; two separate horns of the uterus palpated. Lower segment Caesarean section. Living female child, 7 pounds 8 ounces. The head of the child lay in one cornu and the buttocks in the other. The placenta was on the anterior wall and its lower margin reached the upper limit of the lower uterine segment (Plate 1a). Uterus bicornis unicorpus unicollis.

CASE 3.

Pregnancy 1. Aborted at 5 months.

Pregnancy 2. Normal delivery following prolonged labour. Weight of child unknown. Cotyledon of placenta retained and manually removed on 4th day. No record of shape of uterus having been recognized.

Pregnancy 3. Normal delivery. No other details available.

Pregnancy 4. Three months abortion.

Pregnancy 5. Sent into hospital in labour with transverse lie. Internal podalic version; breech delivery; living male child; placenta retained. Severe postpartum haemorrhage. Crede's expression of placenta. Abnormality of uterus noticed. Hand in uterus revealed a septum in the cavity 2 inches long. This patient had had an operation for appendicitis before marriage. A communication from the hospital where this was performed showed that the following had been written on the appearance of the uterus: "There is a depression in the mid-line of the fundus suggesting a partial bicornute uterus." Uterus bicornis unicorpus unicollis.

Pregnancy 6. Oblique lie at 36 weeks. Normal delivery of living male child, weight 5 pounds 2 ounces. Third stage normal.

CASE 4.

Pregnancy 1. Premature labour 28 weeks. Child stillborn.

Pregnancy 2. Admitted late in labour with a transverse lie. Internal podalic version and breech extraction. Living male child, 7 pounds 6 ounces. Retained placenta manually removed. This revealed a large septum with the placenta situated on the left lateral wall of the uterus and partially filling the left cornu. Uterus subseptus.

CASE 5.

Pregnancy 1. Premature labour at 35 weeks. Living child weighing 6 pounds.

Pregnancy 2. Admitted to hospital with transverse lie and prolapsed cord. Lower segment Caesarean section. Living male child weighing 5 pounds 2 ounces, which died on the 11th day of septicaemia. Septum 1 inch in length in cavity, and a depression on the external surface of the fundus.

The placenta lay in the right cornu and the head of the foetus in the left. Uterus bicornis unicorpus unicollis.

CASE 6.

Pregnancy 1. Twins; both breech; stillborn. Weight unknown.

Pregnancy 2. Forceps delivery. Living child.

Pregnancy 3. Twins; breech, weighing 6 pounds, and foetus compressus.

Pregnancy 4. Admitted with breech presentation; normal delivery of infant weighing 6 pounds, which died in 30 minutes. The abnormal shape of the uterus was recognized *per abdomen*. A hand inserted into the uterus showed the presence of a septum in the fundus. Third stage normal. Uterus bicornis unicorpus unicollis.

CASE 7.

Pregnancy 1. External cephalic version performed twice in pregnancy for transverse lie. Normal delivery of child which died half an hour later.

Pregnancy 2. Cephalic version from transverse performed 4 times in pregnancy with final recurrence. Admitted for Caesarean section. Male child, 7 pounds 11 ounces. The placenta covered the posterior wall of the fundus; a very small bulge was present in the cavity and a dimple at the fundus externally. Uterus bicornis unicorpus unicollis.

CASE 8.

Pregnancy 1. No details are known except that she had "chloroform."

Pregnancy 2. Repeated transverse lie in preg-

PLATE 1a.

PLATE 1b.

PLATE Id.

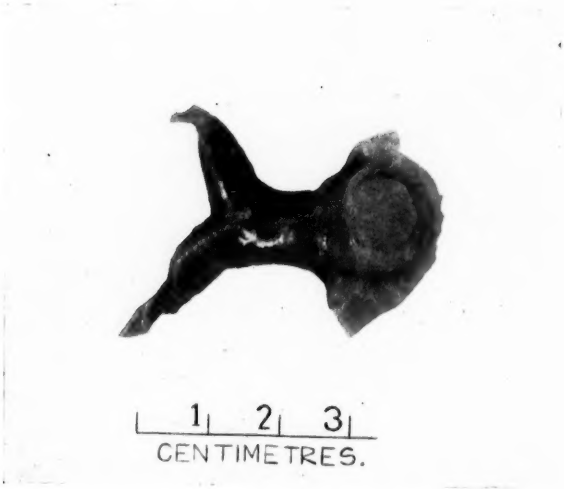

PLATE Ic.

nancy; delivered by internal version. Deformity not recognized.

Pregnancy 3. Admitted fully dilated with transverse lie; internal podalic version and breech delivery. Living male child, 6½ pounds. Hand inserted into the uterus revealed a well-marked septum. The placenta lay on the posterior wall between the septum and the lower segment. No depression on external surface of the fundus was recognizable. Uterus subseptus.

CASE 9.

Pregnancy 1. Patient admitted at 28 weeks with antepartum haemorrhage. She miscarried and the placenta was manually removed. The placenta was situated at the fundus and partially covered the septum. The portion of the placenta inserted on the septum had separated but elsewhere separation had not occurred. Uterus subseptus.

CASE 10.

Pregnancy 1. Miscarriage at 6 months.

Pregnancy 2. Attended antenatal clinic, where at 6 months the abnormal contour of the uterus was noted. At 30 weeks a sudden increase in weight was noted and the patient was admitted to hospital. Three days after admission a gradual rise of blood-pressure commenced. At 36 weeks the foetus lay transversely and the blood-pressure suddenly rose to 240/130. Lower segment Caesarean section was performed. There was a marked cleft between the two cornua and a marked septum of the uterus. The placenta occupied the anterior wall between the septum and the lower segment. A living female child, weighing 5 pounds 7 ounces, was delivered. Uterus bicornis unicorpus unicollis. Plate 1b shows a radiograph of this uterus. The child died on the 4th day. As it had occurred to me that there may be a hereditary factor in this condition autopsy was performed and the uterus bicornis unicorpus unicollis illustrated in Plate 1c was found. Plate 1d shows a radiograph of the specimen. The mother was an only child and there had been no difficulty at her birth.

An attempt was made to radiograph the female children of the other patients. Both surviving children of Case 1 were radiographed. The child from the 2nd pregnancy showed a uterine deformity but the child from the 3rd pregnancy was normal. The child from the 2nd pregnancy of Case 3 was also radiographed and found to be normal. The difficulties of lipiodol injections in very young children are great. The hymen dilates readily without tearing with Hegar's dilators, but the vagina is comparatively long at this age—at least 3 inches. The cervix is very small and can be seized only with difficulty with fine tissue forceps. Surprisingly enough the nozzle of the lipiodol-containing syringe entered the cervical canal in all these children with great ease and without dilatation. The cavity holds about 2 c.cm. of lipiodol which in each of my cases escaped so readily along the tubes that it had disappeared into the abdominal cavity before a picture could be taken, and the shape was only recognized under the screen. An attempt to put larger quantities into the uterus in one child caused the appearance of the lipiodol in what must have been the left ovarian vein as the shadow continued up to the region of the kidney. In view of these difficulties and this last occurrence I felt that the procedure is not only very difficult but not without danger and I have not attempted it on any other children.

Family histories were carefully examined but they were of no real value as the patients were usually ignorant of their relatives' obstetric histories and many of the relatives were scattered owing to war conditions and could not be questioned. Most of the patients' mothers were dead.

It was thought that since this type of uterus shows a regression to that found in animals which have more than one offspring at a time, twinning might have been common. Of the family histories taken none showed any twin pregnancies, except in Case 6, when the patient herself had had twins twice.

During the course of these investigations

my senior colleague, Mr. Harvey Evers, discussed with me a case in which abortion had occurred on 6 occasions, and in which he had detected the presence of a uterus subseptus. Resection of the septum was followed by normal pregnancy. I then determined to investigate some recent cases of repeated abortion to see if I could demonstrate the presence of uterine deformity. Twenty-four cases were sent for; 12 attended and all were radiographed. Two showed the presence of a septum in the uterine cavity.

CASE 11.

Pregnancy 1. Aborted at 2 months.
Pregnancy 2. Aborted at 4½ months.
Pregnancy 3. Aborted at 6 months.
Pregnancy 4. Aborted at 6 months.

This patient was elderly and anxious to have a baby. I therefore excised the septum and repaired the fundus. Lipiodol showed that my attempt was not completely successful and a very small ridge still existed. Five months after operation she became pregnant but at 4¼ months she had an incomplete abortion. When I removed the placenta I found it to be partially inserted over

Pregnancy.

Case	1	2	3	4	5	6
1.	Transverse, S.B.	Transverse, placenta praevia.	Transverse.			
2.	Premature, transverse to breech.	Transverse, presentation of cord, placenta praevia.				
3.	Abortion.	Normal delivery, retention of cotyledon of placenta.	Normal delivery.	Abortion.	Transverse, retained placenta.	Normal delivery, oblique to vertex (spontaneous)
4.	Abortion.	Transverse, retained placenta.				
5.	Premature, vertex, S.B.	Transverse, prolapsed cord.				
6.	Premature twins, breech, S.B. breech, S.B.	Forceps delivery.	Twins, breech and foetus compressus.	Breech, died.		
7.	Transverse, to vertex, died.	Transverse.				
8.	?	Transverse.	Transverse.			
9.	Abortion.					
10.	Abortion.	Transverse.				
11.	Abortion.	Abortion.	Abortion.	Abortion.	Abortion.	
12.	Abortion.	Abortion.				

S.B. = Stillbirth.

the ridge, and this was its point of separation. Elsewhere it was firmly attached. Uterus bicornis unicorpus unicollis.

CASE 12.

Pregnancy 1. Aborted at 2 months.
Pregnancy 2. Aborted at 2 months.

Radiograph showed the presence of a very small septum. In view of the disappointment in Case 11 and the fact that abortion does not always occur I have not, as yet, advised operation in this case. The previous table shows the presentation and other abnormalities found in these 12 cases.

These 12 patients had 33 pregnancies of which the details are known and the following complications occurred:

Transverse lie	12
Abortion	12
Breech	4
Premature labour	3
Retention of whole or part of placenta	3
Prolapsed umbilical cord	2
Placenta praevia	2

These tables are almost self-explanatory of the complications occurring in pregnancy and labour in a uterus showing minor degrees of failure of fusion of the Müllerian ducts. Unless the foetus is very small the presence of a septum in the cavity of the uterus favours the adoption of a transverse lie. When labour begins the soft breech is sometimes forced into the pelvis with a resulting breech delivery.

If the placenta is inserted on the septum, premature separation is common. It also appears that such a septum sometimes prevents the insertion of the placenta as high in the uterus as usual and placenta praevia is favoured. Naturally the complications of transverse lie frequently occur in these cases.

Often the placenta is partly inserted in one cornu and it is a common experience that retention frequently occurs with such an insertion whether the uterus is deformed or not. Retention of the placenta is especially likely to occur in a uterus of this type.

Of the 22 viable children delivered, 4 were stillborn, 1 died after breech delivery and 2 died of causes unconnected with the uterine deformity. This gives a foetal mortality of 22.8 per cent due to the uterine abnormality.

It remains to be considered whether operative correction is called for. Operation, I think, is indicated where a deformity is definitely known to be the cause of the repeated abortion syndrome, but it must not be advised light-heartedly and the risk of rupture of the scar in a subsequent labour must be borne in mind.

Patients who have had unexplained transverse presentations and those suffering from the repeated abortion syndrome should be subjected to radiological investigation of the uterine cavity. By this means I am sure more of these deformities will be recognized and the appropriate measures taken to deal with the dangers and difficulties which may arise in these cases.

For the patient who is known to have such a deformity, careful antenatal care and delivery in hospital are essential, and the patient should be told, in a manner that will not cause alarm, sufficient about her condition to ensure that she will seek advice in a future pregnancy. Finally, the practitioner should bear in mind the fact that the daughters of such patients may inherit the deformity. Further investigation of this aspect of the subject in indicated.

I am indebted to Professor E. Farquhar Murray and Mr. H. Harvey Evers for allowing me to see and treat cases under their care; and to Mr. Evers for his suggestions and permission to publish details of his case; and especially to my friend, Dr.

Herbert J. Johnson, for his co-operation in the radiological work involved in this study; and to Mr. B. S. Armstrong of the Art School, King's College, for the line drawings illustrating this paper.

Addendum.

Since this paper was submitted for publication I have seen 6 further examples of these deformities. All except 1 was recognized by abdominal palpation. Some of these patients are not yet delivered but some interesting facts arise from the 6 cases and are worth recording.

Case 13.

Pregnancy 1. Age 30. Referred to antenatal clinic by her own doctor on May 16th, 1945, for transverse lie. Abnormal shape of the uterus was recognized. Confinement due July 1st, 1945. Repeated attempts to correct transverse lie failed. Lower segment Caesarean section done on June 28th, 1945. Uterus bicornis unicorpus unicollis. The breech was in the left cornu, the head and placenta in the right cornu. Septum about 1½ inches long. Living female child 6 pounds 12 ounces.

To see if this type of uterus is easily inverted an attempt was made to invert it when it was empty. The septum was very rigid and by pulling on it and pushing on the depression on the external surface of the uterus it was proved impossible to produce inversion. It was, however, possible to cause a small degree of inversion by pushing on the apices of both uterine horns. It seems that this type of uterus may be less susceptible to inversion than a normal uterus.

Case 14.

Pregnancy 1. Age 22. Attended antenatal clinic. Delivery expected July 22nd, 1945. On June 21st, 1945, the head was at about the level of the umbilicus and could not be pushed down to the pelvic brim. It was therefore supposed that a soft tissue tumour or a placenta praevia was present. Vaginal examination revealed the lower pole of a soft cystic swelling lying behind the uterus at the brim of the pelvis. Examination under anaesthesia confirmed the findings and ovarian cyst was diagnosed. On June 28th, 1945, the abdomen was opened and a uterus bicornis unicorpus unicollis was found, but there was no other abnormality. There was laevorotation of the uterus through 90 degrees and owing to lateral flexion as well, the left horn lay behind the body of the uterus. The buttocks could be felt in the left horn; the right horn was covered with large venous sinuses and was thought to contain the placental site. The next day the patient asked for a bed pan and on examination the head was found to be showing at the vulva. The child was delivered with the forceps. It was a female weighing 4 pounds 9 ounces, and had a hare-lip and spina bifida. A hand in the uterus showed a septum 2 inches long at the fundus. The placenta lay low on the anterior wall and a small tongue of its upper border lay in the right cornu.

The child died on the 5th day. An autopsy was performed and the uterus found to be normal.

Case 15.

Pregnancy 1. Age 34. Sent to hospital in labour because of non-engagement of the head. Vertex presentation; head above the brim; pelvis normal; very obvious uterine deformity. Labour lasted 3½ days. Normal delivery of a male child weighing 8 pounds 4 ounces. Hand inserted into the uterus after delivery revealed a small septum about ¼ inch long. Placenta on the posterior wall of the uterus reaching to the upper border of the lower segment. Uterus bicornis unicorpus unicollis.

Rudolph[1] wrote a paper explaining certain uterine dysfunctions on an embryological basis. He claimed that the uterus is a bilateral organ and although correctly formed anatomically it may exhibit different physiological properties in the two halves. In this case the contractions of the uterus were watched for some time. The right cornu contracted very strongly but the left exhibited poor contractions and when palpated during the pains the difference in the force of the contractions in the two horns was striking.

CASE 16.

Age 34. 6-gravida. Attended antenatal clinic. Expected delivery July 8th, 1945.

Pregnancy 1. Premature labour; small living baby.

Pregnancy 2. Delivery at term; no other details known.

Pregnancy 3. Abortion at 4½ months.

Pregnancy 4. Abortion at 4½ months.

Pregnancy 5. Abortion at 5 months.

Pregnancy 6. Abnormal uterine contour observed. June 14th, 1945, transverse lie. June 21st, transverse lie. June 27th, spontaneous cephalic version, head not engaged. July 1st, head engaged, left occipito anterior, small baby. This patient is not yet delivered.

CASE 17.

Pregnancy 1. Aged 30. Attended antenatal clinic. Expected date of delivery August 1st, 1945. Symptoms of threatened abortion at 10 weeks. June 13th, abnormal shape of uterus noticed; small baby; vertex presentation. Blood-pressure 140/90; albumin present; admitted to hospital. July 1st, head engaged. Patient not yet delivered.

CASE 18.

Age 41. Gravida 3.

Pregnancy 1. Normal delivery; no other details available.

Pregnancy 2. Normal delivery; no other details available.

Pregnancy 3. When 2 months pregnant she was admitted to hospital with abdominal pain and diagnosed as ectopic gestation. The surgeon who opened the abdomen described the Fallopian tubes as normal, and the uterus as containing a cornual pregnancy. Pregnancy was allowed to continue.

She attended the antenatal clinic at 6 months when the abnormal shape of the uterus was noticed. The pregnancy appears normal otherwise. She is due to be delivered in October, 1945. It appears that at the time of operation the abnormal shape of this uterus was mistaken for a cornual implantation of the ovum giving rise to the temporary irregularity in contour described as Piscazek's sign.

It is not known whether a septum exists in Cases 16, 17, and 18, but from the history I am of the opinion that it probably exists in Case 16. Cases 17 and 18 may be examples of uterus arcuatus.

REFERENCE.

1. Rudolph, L. *Amer. Journ. Obstet. and Gynecol.*, 1940, xxxix, 975.

The Effects of the Injection of Human Semen into Female Animals

BY

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AND

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INTRODUCTION.

THERE has from time to time been some suspicion that semen may have functions other than fertilization and may contain substances which would have a beneficial action on the female genital organs. If evidence of such action could be obtained it would, of course, profoundly influence the technique of contraception. Green-Armytage[1] has concluded from the results of injection of human semen into immature rats and rabbits that "full development of the female genitalia is due to the absorption by the vagina of hormones from the human semen, and that this hormone is probably testosterone or a hormone allied to it." He further states—"The deduction being that any thing or any method which prevents, retards or alters the normal degree of physiological absorption of human semen from the vagina carries with it during the early months and years of marriage the risk of future sterility from failure of uterine development and endocrinal asynchronization."

In view of the far-reaching biological and sociological implications of such findings it seemed desirable that these experiments should be repeated. We have done so and in addition have treated immature and spayed adult guinea pigs not only with semen but also with testosterone propionate to provide a further control.

METHOD.

Human semen was injected into immature rats, immature rabbits and immature and spayed adult guinea pigs. Injections of testosterone propionate were given to immature and spayed adult guinea pigs. When the animals were sacrificed, the uteri and ovaries were removed, sectioned and stained with haemalum and eosin. In addition, some of the uterine sections were stained with Pickworth's Benzidine method[2] to display the vascular pattern.

EXPERIMENTS.

1. *Immature Rats.*

Three of a litter of 6 rats, aged 28 days, were given a subcutaneous injection of 0.5 c.cm. of human semen on alternate days over a period of 14 days. There was no vaginal reaction during the experiment. The remaining animals were used as controls and all 6 were killed 2 days after the last injection.

The uterine sections from the treated and untreated animals are similar in size and structure and there is no evidence of oestrogenic or progestational change in the uteri of

* And in co-operation with the Sterility Clinic of the Royal Samaritan Hospital for Women, Glasgow. The supplies of semen were obtained for us by Dr. W. S. Mack, to whom we are indebted.

the treated rats (Figs. 1 and 2). The vascular pattern is that of the normal immature uterus. The ovaries of injected and control rats show no difference in size or structure —the treatment has not promoted follicular stimulation, ovulation or corpus luteum formation (Figs. 3 and 4). Green-Armytage[1] after a like treatment records marked increase in size together with muscular hypertrophy and progestational changes of uteri of spayed immature rats. It is improbable that our failure to reproduce these positive responses could be attributed to the presence of the ovaries in our animals. It might, however, be suggested that the ovary antagonizes any hormonal action of semen, which of course would imply that it would have no effect on the normal adult female.

2. *Immature Rabbits.*

Two immature rabbits, one 8 weeks, the other 12 weeks old, were given an intravenous injection of 1 c.cm. of human semen in 3 c.cm. of saline on each of 3 days. There was no vaginal reaction during the experiment. They were killed 24 hours after the last injection, together with 2 control rabbits, one 8 weeks and the other 12 weeks.

Compared with the uteri of the control animals the treated uteri do not show any increase in size, endometrial or muscular hypertrophy, or any glandular hyperplasia. The vascular pattern is that of the immature uterus (Figs. 5 and 6).

There is no evidence of any stimulation or other effect on the ovaries (Figs. 7 and 8).

3. *Immature Guinea Pigs.*

Six immature guinea pigs (not litter mates) of weights ranging from 280 to 380 g. were given subcutaneous injections of 1 c.cm. of human semen on alternate days over a period of 20 days. There was no vaginal reaction during the period of the experiment. The animals were killed 2 days after the last injection along with 2 untreated guinea pigs of about 300 g. in weight.

Figs. 9 and 10 are sections of the largest and smallest uteri respectively. On the average there is some slight increase in the size of the uterus compared with the uteri of controls (Fig. 11) but no marked endometrial hypertrophy or signs of progestational changes. The vascular pattern is that of the immature animal and there is no evidence of the antimesometrial hyperaemia of the "oestrous" uterus.[2, 3] The ovaries do not show any sign of stimulation —in both treated and control animals there are large secondary follicles in the ovaries.

4. *Immature Guinea Pigs.*

Six immature guinea pigs (not litter mates) of weights ranging from 280 to 380 g. were given subcutaneous injections of 2 mg. testosterone propionate on alternate days over a period of 30 days.

During treatment there was hypertrophy of the clitoris in all the animals. The vaginae opened in 2 animals (in Animal No. 1 on the 9th day and remained open for 5 days—in Animal No. 3 on the 3rd day for 24 hours) and the vaginal smears were dioestrous (leucocytic). The animals were killed 3 days after the last injection.

Compared with the uterus of the control animal (Fig. 12) there is a more marked increase in size than in the semen-treated animals. The uterine reaction is, however, far short of the response of the immature uterus to oestrogenic therapy,[4] nor are there any progestational changes. The vascular pattern is that of the normal immature uterus. In the ovaries there is no evidence of follicular stimulation, but there appear to be more follicles with commencing atretic change.

5. *Adult Spayed Guinea Pigs.*

Treatment commenced 8 weeks after operation. Six animals were given a sub-

cutaneous injection of 1 c.cm. of human semen every alternate day over a period of 20 days. There was no vaginal reaction. The animals were killed 2 days after the last injection along with an untreated spayed adult as a control. Figs. 13 and 14 show sections of the largest and smallest uterus. Apart from one animal there is no increase in size as compared with the uterus of the control animal (Fig. 15) and no marked hypertrophy or progestational change. The vascular pattern is that of the dioestrous uterus.

6. *Adult Spayed Guinea Pigs.*

Treatment was commenced 8 weeks after operation. Six animals were given subcutaneous injections of 4 mg. of testosterone propionate on alternate days over a period of 20 days.

In all the animals there was hypertrophy of the clitoris. In half the animals the vaginae opened and dioestrous (leucocytic) smears were obtained. Animals were killed 2 days after the last injection. In all the animals there is a definite increase in the size of the uterus when compared with that of the control animal (Fig. 16) but no marked progestational changes. In one animal (Fig. 17) the uterine response is comparable to that obtained in the spayed animals following oestrogenic stimulation.[3] In this animal the greatly enlarged uterus has a dilated lumen, enlarged hypertrophic glands, antimesometrial hyperaemia and all the display of the oestrous uterus.

Discussion.

Injection of semen into immature rats and rabbits yields completely negative results and does not afford any evidence of hormonal activity in semen. In the immature and adult spayed guinea pigs after semen injections there appears to be an increase in the size of the uterus but this requires cautious interpretation. The 6 immature guinea pigs were of varying ages and sizes and their uteri therefore in different stages of immaturity, while the degree of involution of the uteri of spayed adult animals is a variable factor. Moreover, such small responses might be due to some non-specific protein reaction of no particular gynaecogenic significance.

There was no significant difference in the size, number or condition of the ovarian follicles of the control and treated animals. We have to conclude, therefore, that semen has no gonadotropic action.

It is perhaps not unnatural to assume that semen possesses a hormone allied to testosterone, for which, however, there is no experimental confirmation. Parallel experiments with testosterone and semen provide a useful comparison. "Male" effects, for example, hypertrophy of the clitoris and preputial glands, were found only after testosterone treatment and never following semen injections. Vaginal opening with leucocytic smears is a female manifestation of testosterone and could not be evoked by semen.

There are many conflicting observations on the effect of testosterone on the rodent uterus. Korenchevsky, Dennison and Eldridge,[5] Korenchevsky and Hall,[6] and Noble[7] record marked progestational changes in the uteri of spayed adult rats but McKeown and Zuckerman[8] were unable to produce such changes after similar experiments. Deanesly and Parkes[9] have noted an increase in the size of the uterus following testosterone treatment, while Phelps, Burch and Ellison[10] conclude that the response of the endometrium of the guinea pig uterus to testosterone and theelin is qualitatively similar.

With the exception of 1 animal we did not find any progestational changes in the immature or adult spayed guinea pig uteri after testosterone injections and although there was a definite uterine hypertrophy,

DESCRIPTION OF PLATES.

(All illustrations are untouched photomicrographs.)

Owing to the very considerable variation in the sizes of the uteri of the different species of experimental animals it was not possible to use the same magnification throughout and therefore a comparison should not be made of the sizes of the uteri of rat, rabbit, and guinea pig. The same magnification was, of course, used for the photographs of the uteri from animals of the same group.

PLATE I.

FIG. 1. Uterus of immature rat after semen injections. No evidence of oestrogenic or progestational change. × 100.

FIG. 2. Uterus of untreated litter mate. × 100.

FIG. 3. Ovary of immature rat after semen injections. No evidence of ovarian stimulation. × 74.

FIG. 4. Ovary of untreated litter mate. × 74.

PLATE II.

FIG. 5. Uterus of immature rabbit after semen injections. No increase in size, no muscular or endometrial hypertrophy. × 32.

FIG. 6. Uterus of untreated control of the same age. × 32.

FIG. 7. Ovary of immature rabbit after semen injections. No evidence of ovarian stimulation. × 120.

FIG. 8. Ovary of untreated control of the same age. × 120.

PLATE III.

FIGS. 9 AND 10. Uteri of immature guinea pigs after semen injections. Fig. 9 represents the largest and Fig. 10 the smallest uterus of the group of 6 treated animals. Slight increase in size but no marked endometrial hypertrophy. × 45.

FIG. 11. Uterus of untreated control approximately of the same age. × 45.

FIG. 12. Uterus of immature guinea pig after testosterone propionate administration. Definite increase in size, furthermore the uterus with its wider lumen has lost its immature appearance. Cf. Fig. 11. × 45.

FIGS. 13 AND 14. Uteri of spayed adult guinea pigs after semen injections. Fig. 13 represents the largest and Fig. 14 the smallest uterus of the 6 treated animals. Apart from some general increase in size there is no marked endometrial hypertrophy or progestational change. × 22.

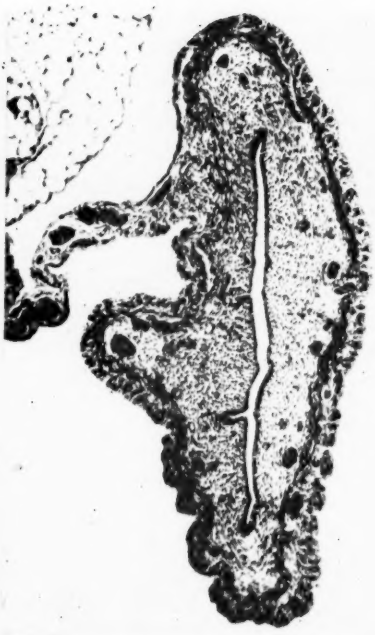
FIG. 15. Uterus of an untreated spayed adult control. × 22.

FIGS. 16 AND 17. Uteri of spayed adult pigs after testosterone administration. Fig. 16 represents the smallest, and Fig. 17 the largest uterus from the group of 6 treated animals. In Fig. 17 the uterine response is comparable to that obtained in the spayed animals following oestrogenic stimulation. Cf. figures with Fig. 15. × 22.

PLATE I

FIG. 1

FIG. 2



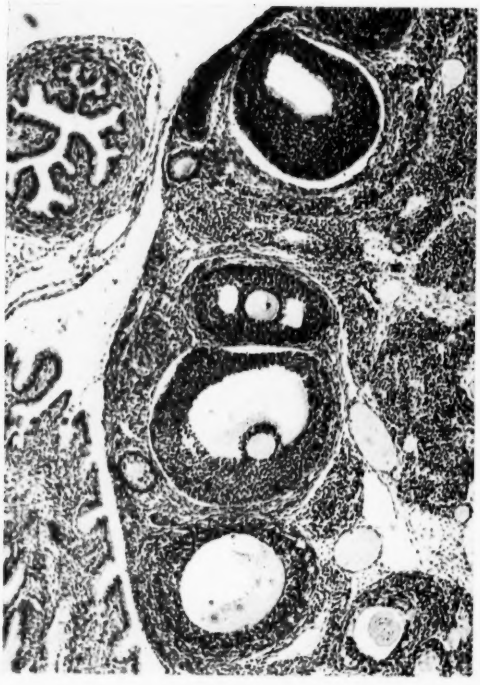


FIG. 3

FIG. 4

B., S. & W.

PLATE II

FIG. 5

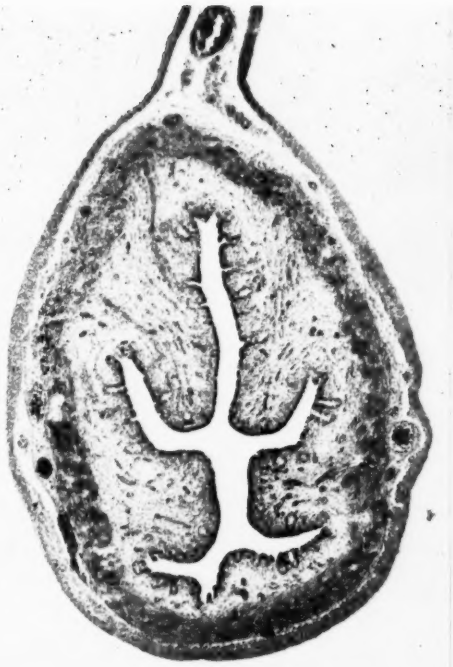
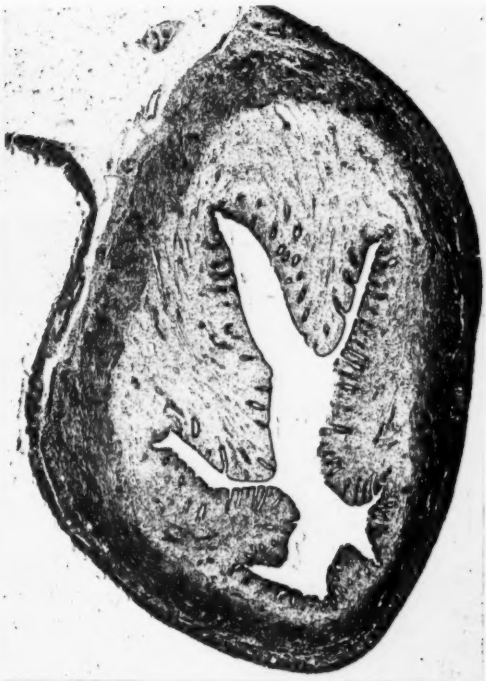


FIG. 6



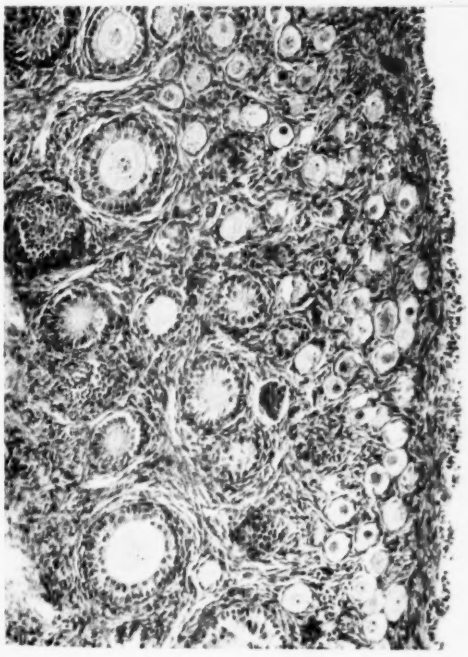


FIG. 7

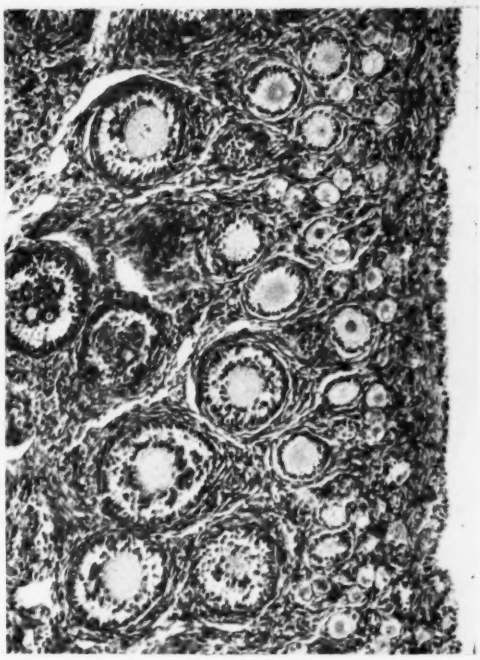


FIG. 8

B., S. & W.

PLATE III

FIG. 9

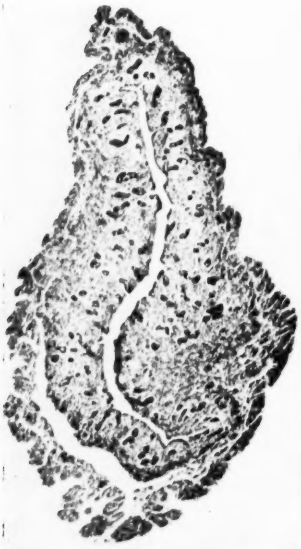


FIG. 10

FIG. 11

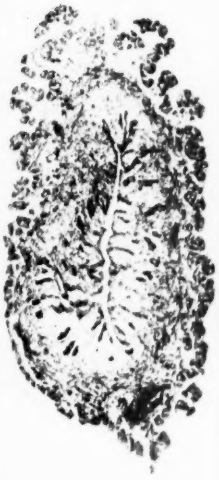


FIG. 12

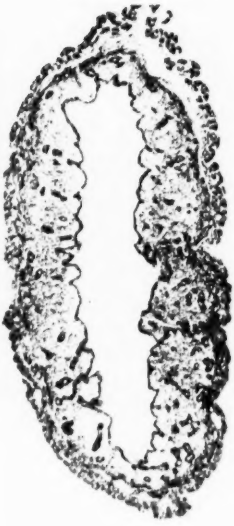


FIG. 14

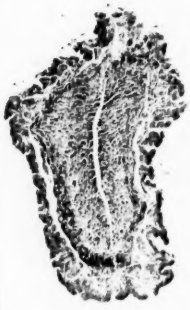
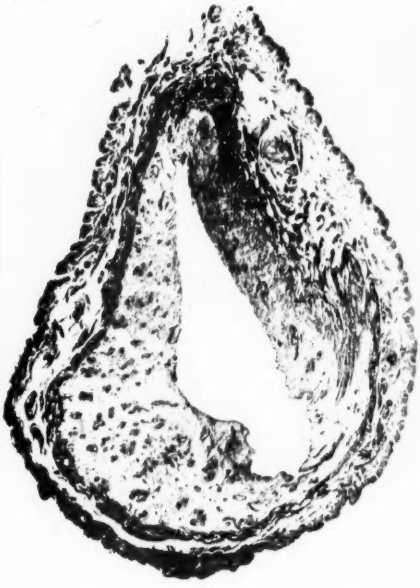


FIG. 15



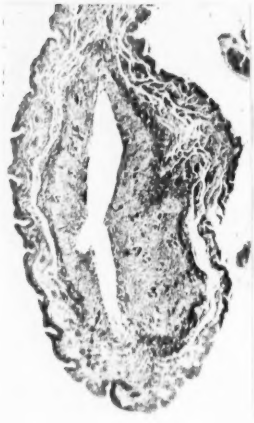


FIG. 13

FIG. 16

FIG. 17

it compares unfavourably with the results obtained after oestrogenic stimulation[3, 4] The weight of evidence for and against the gonadotropic action of testosterone is about equal and is reviewed by Korenchevsky,[11] Noble,[7] and Robson.[12] We could not find any evidence of any stimulating (gonadotropic) effect on the ovaries from testosterone. The variety and range of the responses of the female to testosterone propionate treatment, which have been recorded in different animals under many experimental conditions, would make it hazardous to predict the results in any given instance of testosterone propionate therapy in the female.

From our experiments we are of the opinion that the final development of the uterus is not a function of semen and further that semen does not posses the biological qualities of testosterone, nor is it probable that testosterone could be entrusted to ensure uterine maturation. In this connexion it has recently become apparent that both male and female sex hormones are present in the female organism and a number of the 17 ketosteroids have been recovered from the female urine. Callow and Callow[13] found androsterone and transdehydroandrosterone in the normal female urine in amount comparable to that obtained from the urine of the normal male. If therefore "male" hormone is necessary to promote full uterine development it is already available in the female.

It has been suggested elsewhere[14] that the inability to induce in immature animals by hormonal treatment all the uterine changes necessary to maintain pregnancy, and the relative sterility of adolescence are but different aspects of the same fundamental problem. What Mirskaya and Crew[15] refer to as the lack of some "essential contribution from the immature soma" is manifest in the inability of the immature uterus to respond maturely to hormonal stimulation. This would imply that delayed maturation may exist along with a normal hormonal balance. Reynolds[16] is of the opinion that uterine tissue has to accustom itself to periodic hormonal activity and that there is a time of experience during which it acquires the optimal capacity for pregnancy. In our view the gradual transformation of the stubbornly immature into the mature uterus is more likely to be a function of time than the perquisite of the male. Coitus of course may cause reactions independent of the presence or absence of semen in the vagina, for example, postcopulatory ovulation in rabbits, and these results, which are concerned only with the activity of semen, do not exclude the possibility that sexual union may produce effects from reflex nervous stimulation.

Summary.

1. A series of injections of human semen were given to immature rats and rabbits. There was no vaginal reaction during the experiments, no evidence of oestrogenic or progestational change of the uterus and no ovarian stimulation.

2. Injections of human semen were given to immature guinea pigs. There was no vaginal reaction. On the average there was a slight uterine hypertrophy but this was not regarded as significant. No evidence of ovarian stimulation.

3. Injections of testosterone propionate were given to immature guinea pigs. In all the animals there was during treatment, hypertrophy of the clitoris and in 2 guinea pigs the vaginae opened and dioestrous smears were obtained. There was uterine enlargement, more marked than in the semen-treated guinea pigs but far short of the response of the immature uterus to oestrogenic therapy. There were a greater number of atretic follicles in the ovaries.

4. Injections of human semen were given to spayed adult guinea pigs. There

was no vaginal reaction during treatment. There was, on the average, some slight increase in the size of the uterus but this was not regarded as significant.

5. Injections of testosterone propionate were given to spayed adult guinea pigs. During treatment there was hypertrophy of the clitoris in all animals, half of which also showed vaginal reaction in the form of vaginal opening and dioestrous smears. There was a definite uterine enlargement but in only one animal was the uterine response comparable to that obtained in spayed adult guinea pigs after oestrogenic stimulation.

ACKNOWLEDGEMENTS.

Testosterone Propionate was generously provided by Messrs. Boots, Ltd., and Messrs. British Schering.

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The Influence of Social and Economic Factors on Stillbirths and Neonatal Deaths*

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PREMATURITY.

IN a previous paper[1] the importance of prematurity as a cause of stillbirth and neonatal mortality in Social Classes III, IV and V of the community has been brought out. It is now proposed to examine the probable causes of prematurity, basing the discussion on the *data* already presented.

Definition.

The term prematurity is used here to include all infants of $5\frac{1}{2}$ pounds or less irrespective of the duration of gestation. In some cases the pregnancy had reached full time by dates, but the child was classified as premature by weight.

The League of Nations Medical Committee (1936) suggested the use of the weight basis if the pregnancy had reached the 28th week. Recently Henderson[2] suggested that infants below 2 pounds 12 ounces (1,250 g.) weight should not be included, but should be regarded as abortions or previable, but since some infants of this weight survive and many live for days, they can hardly be classified as abortions. There is a better case for having a lower weight limit for stillbirths.

INCIDENCE OF PREMATURITY.

General Review.

The incidence of prematurity is difficult to obtain because of the difficulty of accurate weighing in domiciliary practice. In New York State (1936) the incidence of prematurity was estimated to be 4.3 per cent. In New York City (1940) the incidence was 7 per cent. In Chicago the incidence as estimated by Bundesen[3] was 6.5 per cent. In Birmingham in 1943[4] the figure was 6.3 per cent. Hospital figures, while they give much information about premature infants not available in domiciliary practice, do not represent a typical cross section of the community. Chicago Lying-in Hospital (1940) had a prematurity-rate of 5.6 per cent, and this seems fairly representative of American hospitals. In Britain, hospital figures are much higher than this. Queen Charlotte's Hospital had an incidence of 8.11 per cent[5]; in booked cases it was 6.78 per cent, and in emergency cases 27.2 per cent. The incidence in hospital will depend upon the proportion of emergency cases treated. In the Aberdeen Maternity Hospital (1941–2) the incidence of prematurity was 13.4 per cent; (booked cases 8.8 per cent, emergency cases 39.4 per cent).

Aberdeen Study.

In the following investigation booked hospital cases only have been considered—Group 2. These have been compared with nursing home cases—Groups 1 and 3. During the years 1938–44, 8,808 booked cases were treated, and in 738 instances labour resulted in a premature baby according to the above definition (8.38 per

* Continued from p. 234 of June issue.

cent). There were 798 babies of $5\frac{1}{2}$ pounds or less, 8.97 per cent of the total infants born—see Table I. The incidence of prematurity in cases booked under the domiciliary midwifery scheme during the years 1942–43 was 7.4 per cent. The patients belong to the same social class as the hospital cases, and when the two groups are taken together it brings the incidence of prematurity in "working class" practice to 8.1 per cent. During the years 1938–44 there were 1,419 deliveries in the nursing home group (Group 1), with 71 premature infants, 5 per cent. If the incidence of prematurity for all the other cases not born in hospital or under the domiciliary scheme be 5 per cent, which is a low estimate, the total prematurity-rate for the City would be about 7 per cent. In the group of 501 specialist cases, Group 3, the incidence of prematurity was 4 per cent (20 cases—1 stillbirth and 19 live births). There is a much greater incidence of prematurity in working-class practice than in the nursing home groups.

TABLE I.

Causes of Prematurity in 738 Cases out of 8,808 Booked Hospital Cases.

(6 years' data).

GROUP 2.

Cause of onset of premature labour	Number	Per cent of total premature labours
Cause unexplained	383	51.9
Accidental haemorrhage (without toxaemia)	29	3.9
Eclamptic toxaemia	119	16.1
Twin pregnancy (including 15 cases of toxaemia) ...	90	12.2
Gross foetal deformity	25	3.4
Placenta praevia	20	2.7
Syphilis	19	2.6
Severe maternal heart disease	19	2.6
Miscellaneous	34	4.6
Total premature labours	738	8.38 per cent of the total deliveries
Total cases of prematurity	798	8.97 per cent of the total babies

Tables II, III and IV show an analysis by weight of the cases of prematurity in each group. They show that not only is the incidence of prematurity greater in Group 2 cases, but the proportion of very small babies is greater. The mortality in the premature infants in Group 2 is 257 per 1,000 compared to 119 in Group 1. Excluding the premature stillbirths, the weight group $5\frac{1}{2}$ to $4\frac{1}{2}$ pounds contains 75 per cent of the Group 1 cases, and 62 per cent of the Group 2 cases. In Group 1, 6.8 per cent of the premature infants weighed $3\frac{1}{2}$ pounds or less, while 16.3 per cent of the Group 2 cases were of this weight. It is well known that the mortality in premature infants varies with the birth weight. In the weight group $5\frac{1}{2}$ to $4\frac{1}{2}$ pounds the mortality in Group 2 cases was 106 per 1,000 compared with 45 per 1,000 in Group 1. In the weight group $4\frac{1}{2}$ to $3\frac{1}{2}$ pounds the mortality in Group 2 cases was 294 per 1,000, and in Group 1, 91 per 1,000. Not only, therefore, is the incidence of prematurity in Group 2 much higher than in Group 1, and the proportion of very small infants greater, but for the same weight the mortality in Group 2 is twice or three times that of Group 1. This difference is due to the fact that the infants in Group 1 are much more vigorous and begin to gain weight more quickly than those in Group 2; it is not due to a better standard of nursing and medical care. There are no special facilities for nursing premature infants in the nursing home where Group 1 infants are born comparable to those available in the maternity hospital for Group 2. This dif-

TABLE II.

Weight Distribution and Mortality in 59 Live-born Premature Infants in Group 1, out of 1,419 Cases.

Weight in pounds ...	5½–5	5–4½	4½–4	4–3½	3½–3	3–	Total
Lived	26	16	8	2	0	0	52
Died	0	2	1	0	2	2	7
Per cent of total cases ...	44.1	30.5	15.2	3.4	3.4	3.4	100
Mortality per 1,000	45		91		1,000		119

TABLE III.

Weight Distribution and Mortality in 626 Live-born Premature Infants in Group 2.

Weight in pounds ...	5½–5	5–4½	4½–4	4–3½	3½–3	3–	Total
Lived	233	114	60	36	17	5	465
Died	27	14	17	23	36	44	161
Per cent of total cases ...	41.5	20.4	12.3	9.4	8.5	7.8	100
Mortality per 1,000	106		294		784		257

TABLE IV.

Weight Distribution and Mortality in 19 Live-born Premature Infants in Group 3.

Weight in pounds ...	5½–5	5–4½	4½–4	4–3½	3½–3	3–	Total
Lived	3	9	2	–	2	–	16
Per cent of total cases	2	0	0	–	1	–	3
Mortality per 1,000	–	–	–	–	–	–	158

ference in vitality must be taken into account when comparing the mortality figures from different parts of the country and different social groups. It is more likely to explain the great difference in mortality recorded by Crosse in Birmingham and by Field in London (quoted by Parsons[6]) than differences in methods of feeding or nursing. Crosse's results are similar to those in Aberdeen Group 2, and probably refer to the same social class. In both groups the proportion dying of infection (theoretically avoidable) was about 10 per cent; about 70 per cent of the deaths occurred within a short time of birth, and these deaths are largely unavoidable at the moment, despite the most modern hospital facilities.

ETIOLOGY OF PREMATURITY.

Unfortunately not enough information is available about the health of the mothers in Group 1 during pregnancy to give a list of the causes of the prematurity in this group. Table V gives a list of the maternal conditions responsible for the onset of premature labour in Group 3, and, except in 3 cases out of 20, the cause was well defined and due to a well-recognized obstetrical condition. Table I gives a list of the causes of the onset of premature labour in Group 2 and their relative frequency. In 51.9 per cent the cause of the prematurity could not be explained. This is in direct contrast to the findings in Group 3 which, although numbers are small, show that only 3 out

20 cases came into this category. There is therefore a striking difference in etiology between the 2 groups. In the one group the premature labours are nearly all due to well-recognized obstetrical causes, while in the other more than half of them are unexplained. When the cases are analysed according to the date of confinement it is found that in 19 per cent of the cases of unexplained prematurity in Group 2 the pregnancy had reached 40 weeks, and was, therefore, full-time by date. In 34 per cent of cases the pregnancy had reached 38 weeks. Therefore in about one-third of these cases of unexplained prematurity the problem seems to have been more an interference with the growth and nutrition of the foetus rather than the premature onset of labour. In Group 3 there were 2 out of 20 cases of prematurity full-time by date, and in both cases the mothers' health seemed good during pregnancy. It will be shown later that many of the women in Group 2 are small themselves and have small babies, for example, 13.8 per cent of them are under 5 feet in height, and in this group 34 per cent of the babies are between $5\frac{1}{2}$ and $6\frac{1}{2}$ pounds in weight.

Table VI is an analysis of 338 consecutive cases of unexplained prematurity in Group 2, arranged according to age and parity, and it shows that unexplained prematurity is slightly more common in primiparae than multiparae, and it increases with age after the age of 24. Pregnancies repeated too frequently result in increased frequency of prematurity. For example, the rate in the 3rd, 4th and 5th pregnancies under 24 years was 5.9 per cent, while in women of 30 to 34 it was only 3.9 per cent. In the 6th, 7th and 8th pregnancies in women between 25 and 29 it was 8.1 per cent, in women 10 years older it was 3.6 per cent. Numbers are so small that reliable conclusions on the point cannot be reached. Very few of these women were in what could be described as poor health, and few had any complaint. The general appearance of the primigravidae was usually much better than that of the multiparae, and yet they showed a higher incidence of prematurity.

The tendency to prematurity of unknown cause is more common in women who have had previous premature babies. For example, in 81 women who had 1 previous pregnancy 20 (25 per cent) had an unexplained premature baby and 16 per cent had had an abortion previously. In a group of 82 having had 2, 3 or 4 previous pregnancies 31 (38 per cent) had had previous premature babies, 12 (15 per cent) had previous abortions. Some had as many as 2 or 3 premature babies. Out of 25 women who had 5 or more previous pregnancies 17 (68 per cent) had had either a previous premature baby or an abortion.

Since Group 2 corresponds roughly to Classes III, IV and V of the Registrar General's classification and Groups 1 and 3 to Classes I and II, it is clear that unexplained prematurity is relatively common among the poor and uncommon among the well-to-do. It must therefore be related to social and economic conditions.

TABLE V.

Shows the Causes of Prematurity in 20 Cases out of 501 Specialist Cases. (Group 3.)

Eclamptic toxaemia	13	(9 induced)
Severe maternal heart disease ...	2	
Full time by dates	2	
Anxiety state	1	(induced)
Gross foetal deformity	1	
Unknown cause	1	

With regard to the recognized obstetrical causes of prematurity Table I shows that eclamptic toxaemia is the most common because of spontaneous or induced premature onset of labour. Table VII shows that the incidence of prematurity due

TABLE VI.

Prematurity 'Cause Unexplained,' Including Premature Stillbirths in Hospital Booked Cases. (Group 2) by Parity and Age Group.

	Age distribution													
	−20		20–24		25–29		30–34		35–39		40+		Total	
Parity	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
1	27	4.7	59	4.0	38	5.1	18	6.1	8	7.2	—	—	150	4.7
2	4	5.8	31	4.6	26	3.9	13	4.2	6	5.7	1	—	81	4.4
3, 4, 5	—	—	19	5.9	30	4.3	20	3.9	9	4.0	3	4.6	82	4.5
6, 7, 8	—	—	—	—	8	8.1	2	1.1	6	3.6	2	3.3	18	3.5
9+	—	—	—	—	1	—	3	6.0	3	3.5	—	—	7	4.0

TABLE VII.

Shows the Incidence of Prematurity Due to Eclamptic Toxaemia in 7,476 Consecutive Cases in Group 2 by Age and Parity.

(5 years' Data).

Age of mother	−20			20–24			25–29			30+			All ages		
	No.	Prematurity	Per cent	No.	Prematurity	Per cent	No.	Prematurity	Per cent	No.	Prematurity	Per cent	No.	Prematurity	Per cent
No previous pregnancies	562	12	2.1	1458	18	1.2	739	21	2.8	401	17	4.2	3160	68	2.2
Previous pregnancies	68	0	0.0	999	3	0.3	1455	7	0.5	1794	17	0.9	4316	27	0.6
All pregnancies	630			2457			2194			2195			7476	95	1.3

to toxaemia is more than 3 times as great in a first pregnancy as in subsequent pregnancies. It also rises with age after the age of 24 years. Unfortunately the incidence of prematurity due to toxaemia in Group 1 cannot be compared with Group 2 since the necessary clinical details are not available. Group 3, which is much smaller, is available, however, for comparison. There were 13 cases of prematurity due to toxaemia in this group (Table V), an incidence of 2.6 per cent compared to 1.3 per cent in Group 2. This higher incidence of prematurity in Group 3 is due to its unfavourable age and parity distribution. Tables VIII and IX show these 2 groups arranged by parity and age to show the incidence of eclamptic toxaemia. The total incidence was 4.4 per cent in Group 3 and 8.5 per cent in Group 2. In the age group 25 to 34 in primiparae in Group 2 the incidence of toxaemia was 3 times that of the same age group in Group 3. The incidence of eclamptic fits was 0.59 per cent (17 cases of eclampsia in 2,890 cases) in Group 2, and 0.20 per cent (1 out of 501 cases) in Group 3. It has been shown that pre-eclamptic toxaemia is the most common cause of prematurity in Group 3 (65 per cent of the total in Group 3 as against 16.1 per cent in Group 2), and despite this the incidence of pre-eclampsia is only slightly more than half that in Group 2. This fact, plus the absence of prematurity of unknown causes, explains very largely the difference in prematurity-rates between the two groups.

Twin pregnancy is the next most common cause of prematurity in Group 2. In

TABLE VIII.

Incidence of Eclamptic Toxaemia in 2,890 Consecutive Cases in Group 2 by Age and Parity.

(2 years' data.)

(Only those cases having Oedema or Albuminuria as well as Raised Blood-pressure are included.)

Age of mother	−24			25–34			35+			All ages		
Parity	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent
No previous pregnancy	886	85	9.6	422	61	14.5	64	10	15.6	1372	156	11.4
Previous pregnancy	340	12	3.5	899	57	6.3	279	22	7.9	1518	91	5.9
										2890	247	8.5

TABLE IX.

Incidence of Eclamptic Toxaemia in 501 Specialist Cases in Group 3 by Age and Parity.

Age of mother	−24			25–34			35+			All ages		
Parity	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent	No.	Toxaemia	Per cent
No previous pregnancy	56	5	8.9	199	9	4.5	45	3	6.7	300	17	5.7
Previous pregnancy	10	0	0.0	133	2	1.5	58	3	5.2	201	5	2.5
										501	22	4.4

7,514 consecutive cases in Group 2 (5 years *data*) twins occurred 79 times, an incidence of 1 in 95 births. The incidence was 1 in 118 in the 1st pregnancy and 1 in 63 in the 6th pregnancy onwards. During the years 1942–43 there were 2,890 booked hospital cases in Group 2, and twins occurred on 44 occasions (1 in 65 births). Of these 88 twins 63 were premature weighing $5\frac{1}{2}$ pounds or less (72 per cent) distributed as follows:

$5\frac{1}{2}$ to $4\frac{1}{2}$ pounds	31
$4\frac{1}{2}$ to $3\frac{1}{2}$,,	14
$3\frac{1}{2}$ pounds or less	18

There were 5 stillbirths and 17 neonatal deaths, giving a combined mortality of 25 per cent. In Group 1 out of 1,419 cases twins occurred on 14 occasions (1 in 101 births). Of the 28 babies 9 were premature weighing $5\frac{1}{2}$ pounds or less (32 per cent), distributed as follows:

$5\frac{1}{2}$ to $4\frac{1}{2}$ pounds	5
$4\frac{1}{2}$ to $3\frac{1}{2}$,,	4
$3\frac{1}{2}$ pounds or less	0

There was no stillbirth and only 1 neonatal death—a combined mortality of 3.6 per cent. The combined total stillbirth and neonatal mortality in Group 1 was 38.3 per 1,000, and in Group 2, 64.9 per 1,000, an excess over Group 1 of 69 per cent. In the case of twin pregnancy on the other hand, the mortality in Group 2 is more than 6 times that in Group 1. The other causes of prematurity are too small numerically for comparison to be made between the 2 groups.

Several recent publications agree in general with the observations made here. Crosse[4] found that in 37.7 per cent of a total of 924 premature births an adequate explanation could not be found for the onset of labour, and in one-third of the cases a history was given of 2 or more premature

labours or miscarriages. Sandifer,[5] in a series of 1,000 cases of premature labour, found that the cause of the premature onset was unexplained in 37.2 per cent. The inclusion of emergency cases, as was done in the above series of cases, would increase the proportion of premature labour due to such conditions as toxaemia and placenta praevia and other recognized obstetrical causes of premature labour, so that for booked cases which are much more likely to represent a cross section of the area served by the hospital the proportion where the onset was unexplained might be in the neighbourhood of 50 per cent.

Summary and Conclusions.

The conclusion to be drawn from these figures is that in Scotland the incidence of prematurity is greater than in England, and in the Scottish cities and maternity hospitals greater than in the hospitals and cities in England and America. In a previous paper it has been shown that the mortality from prematurity is higher in Scotland than in England and Wales or Holland, and that the excess of neonatal mortality in Scotland is due largely to the excess mortality from prematurity. It has been shown that prematurity is almost twice as high in social Classes III, IV and V as in Classes I and II. In the former classes 50 per cent of the prematurity is unexplained; in the latter very few are in this category. The most common obstetrical condition associated with prematurity is eclamptic toxaemia, and this is twice as common among the poor as the well-to-do for the same age and parity group. In Classes III, IV and V, as represented by Group 2 in this paper, twin pregnancy is a great strain, and, judging from the cases studied in this series, the foetal mortality is 6 times that of Classes I and II. The most likely explanation of these differences is that in Group 2 the health and nutrition of the mother is inferior to that of the women in Groups 1 and 3. In Group 2 there are great variations since some obviously living at a low economic level have large families with no premature infants or abortions while others have repeated abortions or premature labours. This suggests that some women are much better able to utilize the food they eat than others. This in turn may be dependent on growth and general nutrition in early years rather than on diet during the pregnancy.

Nutrition.

General Considerations.

We have shown that when hospital "booked cases" probably corresponding to Social Classes III, IV and V are compared with cases in private practice, Social Classes I and II, a much greater proportion of babies born are feeble. This shows itself in more unexplained stillbirths and more neonatal deaths due to congenital debility and atelectasis. There is a high incidence of prematurity which increases both the stillbirth and the neonatal mortality-rates. The great difference in the vitality of the offspring between the classes is hidden to some extent by the fact that in the hospital patients the age and parity distribution is much more favourable. In the pre-war years it has been shown by Orr[7] and others that as the income rises the amount spent on food rises and the diet improves. The consumption of bread and potatoes is practically uniform throughout the different income level groups. Consumption of milk, eggs, fruit, vegetables, meat and fish rises with income. Thus in the poorest group the average consumption of milk including tinned milk, is equivalent to 1.8 pints per head per week; in the wealthiest group 5.5 pints. The poorest group consume 1.5 eggs per head per week; the wealthiest 4.5. The

poorest spend 2.4 pence on fruit; the wealthiest 1 shilling and 8 pence. The average diet of the poorest group, comprising 4,500,000 people (10 per cent of the population, expending on the average 4 shillings per head per week on food) is by the standard adopted deficient in every constituent examined. The 2nd group comprising 9,000,000 people (20 per cent of the population spending 6 shillings per head per week on food) is adequate in protein but deficient in all the vitamins and minerals. The 3rd group, 9,000,000, spending 8 shillings per week on food, is deficient in vitamins and minerals. Therefore 50 per cent of the population has a diet inadequate for full health. This 50 per cent contains about two-thirds of the children. As income increases, disease and death rate decrease, children grow more quickly, adult stature is greater and general health and physique improve.

Surveys have shown that in Scotland before the war there was twice as much poverty as in England, unemployment was greater and slums and squalid living conditions were much more common. Common observation shows that there are striking differences in physique and nutrition between the women seen at hospital antenatal clinics and those seen in private practice. There are differences in stature, the state of the teeth and gums, the condition of the hair and skin, the incidence of anaemia and the general air of vitality. These differences are difficult to measure accurately, however. Chemical tests for nutritional deficiency are difficult to carry out; even haemoglobin estimations can be misleading unless care is exercised. It is known that anaemia is common in pregnant women.[8]

The teeth of women attending hospital antenatal clinics are much worse than those of women in private practice, and artificial teeth are much more common. This might be due to some extent to less care of the teeth and the practice of extraction rather than filling.

The height of the patient is easily taken, and gives some idea of the nutritional state in the years of growth. In 1883 the British Association Anthropometric Committee showed that the average height of boys of $13\frac{1}{2}$ years in an industrial school was 2.6 inches below that of artisan boys of the same age, and 5.8 inches below that of boys of the professional classes. Yudkin[9, 10] recently demonstrated in Cambridge that children from smaller families were taller and heavier and had a higher haemoglobin level and a stronger grip than children from larger families—these differences being greater in the children from poorer areas. He also found that the nutritional state of the children and mothers was better in those who had more to spend. For example, when the sum available for food was between 7 shillings and 3 pence and 10 shillings and a penny per head per week, the children were on the average $1\frac{1}{4}$ inches taller and 6 pounds heavier than those in families with a possible food expenditure between 4 shillings and 7 pence and 7 shillings and a penny.

Height of Mother in Relation to Weight of Baby.

The heights of four groups of expectant mothers have been compared, those attending (a) a relatively expensive nursing home, (b) a nursing home where the fees are less, (c) "booked" cases at the Aberdeen Maternity Hospital and (d) "booked" cases at the Glasgow Maternity Hospital. The results are seen in Fig. 1, and they show that the percentage of the women in each group who are less than 5 feet in height increases from 1.6 in group (a) to 26.8 per cent in group (d). Conversely the percentage of women who are 5 feet 6

inches or more diminishes from 24 per cent in group (a) to 3.3 per cent in group (d). In group (a) modal height is between 5 feet 5 inches and 5 feet 6 inches, in group (b) between 5 feet 4 inches and 5 feet 5 inches, and in groups (c) and (d) between 5 feet 2 inches and 5 feet 3 inches.

In the same city, therefore, there are differences of about 3 inches in the height of two groups of expectant mothers selected only on the basis of the expense of the confinement. It seems reasonable to assume that the women in group (c) would have grown these extra inches if their nutrition had been better in childhood. When the women in group (c) were divided into two groups, those under 25 years of age and those over 35 years, no evidence of increase in height among the younger women was noticed. In a small group of cases in which the grandmother was measured as well as the mother, the grandmother was found to be taller than the mother in half the cases. It might have been expected that the younger women would have been taller in view of the improving state of health of the community, but possibly some of the grandmothers were reared in the country and came to live in the city, where the nutritional level fell.

When the weights of the babies in the two groups are compared, it is found that in group (a) 9.2 per cent and in group (c) 18.8 per cent weigh between $5\frac{1}{2}$ and $6\frac{1}{2}$ pounds and in group (a) 39.2 and in group (c) 40.2 per cent weigh between $6\frac{1}{2}$ and $7\frac{1}{2}$ pounds. In group (a) 33.1 per cent and in group (c) 29.7 per cent weigh between $7\frac{1}{2}$ and $8\frac{1}{2}$ pounds. In group (a) 18.3 per cent and in group (c) 11.1 per cent weigh over $8\frac{1}{2}$ pounds. The babies in group (a) are therefore heavier on the average than those in group (c).

Each group was next analysed to see what relation, if any, existed between the height of the mother and the size of the baby. The results are seen in Figs. 2 and 3. They show that in groups (a) and (c) the weight of the baby increases with the height of the mother. In (a) there are not enough patients under 5 feet in height to analyse, but thereafter, as the mother increases in height, the proportion of large babies (over $8\frac{1}{2}$ pounds) rises from 10 per cent to 29.6 per cent. In group (c) in which the mother is less than 5 feet in height 34 per cent of the children are between $5\frac{1}{2}$ and $6\frac{1}{2}$ pounds in weight. The proportion falls to 9.1 per cent when the mother is 5 feet 6 inches and over. Conversely when the mother is under 5 feet in height 5.5 per cent of the babies are over $8\frac{1}{2}$ pounds. When the mother is 5 feet 6 inches or over, 13.7 per cent of the babies are over $8\frac{1}{2}$ pounds. Thus there are many more large babies in group (a), 29.6 per cent with mothers of 5 feet 6 inches or more over $8\frac{1}{2}$ pounds in weight, compared to 13.7 in group (c). It is likely that in both groups (a) and (c) women of 5 feet 6 inches and over have reached their maximal height, so that the increase in the weight of the babies in group (a) may be related to better diet during pregnancy. When women between 5 feet and 5 feet 2 inches in height, or between 5 feet 3 inches and 5 reet 5 inches in the 2 groups are compared, less difference in the weight of the baby is seen. Some of the women in group (c) are much smaller than they might have been had they been well fed as children. If there are hereditary factors operating to produce big babies to big mothers, which seems likely from a study of group (a), then this acting in group (c) would tend to produce a larger baby than the height of the mother or her nutrition during pregnancy would lead one to expect. This factor might explain why at the height 5 feet to 5 feet 2 inches in group (c) 11.9 per cent of the infants are more than $8\frac{1}{2}$ pounds, while in group (a) only 10 per cent exceed $8\frac{1}{2}$ pounds. There is no

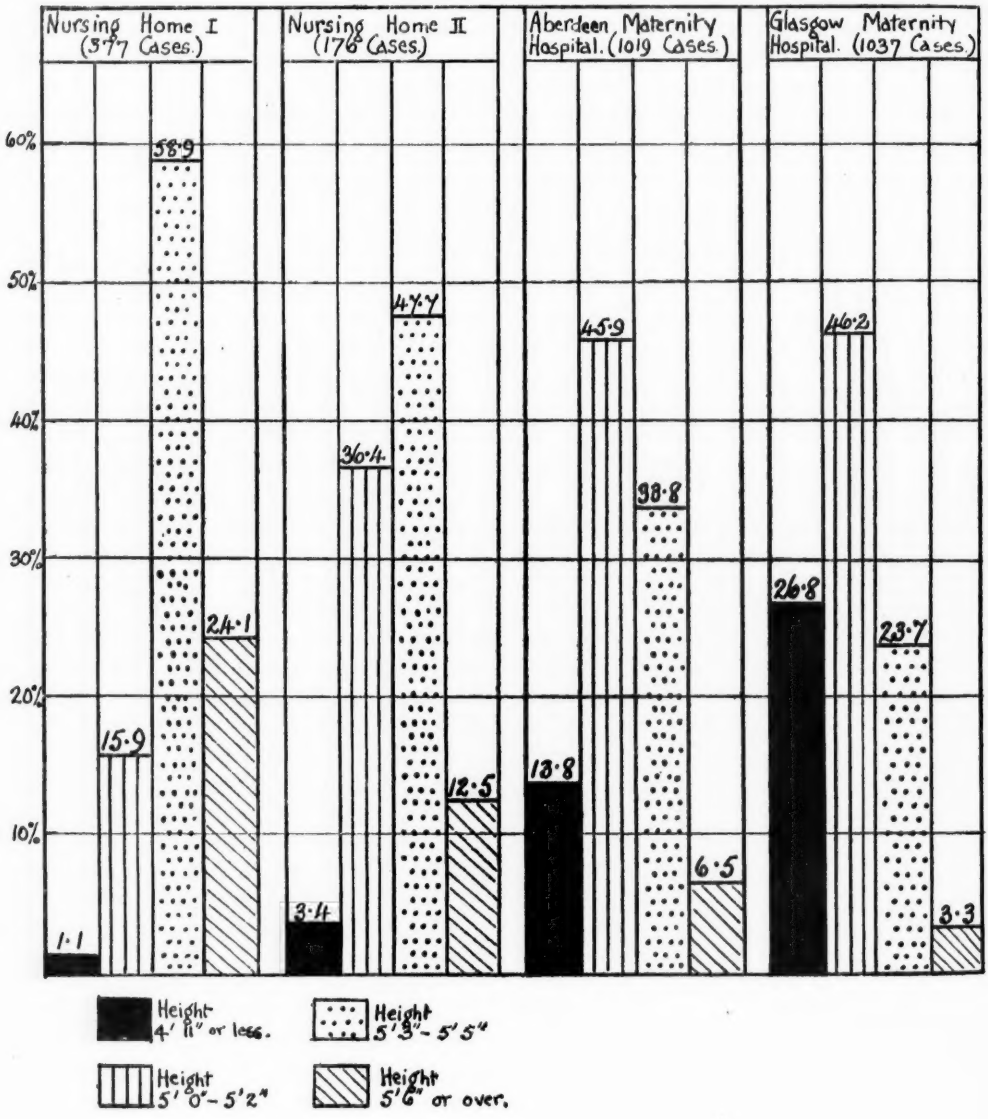

FIG. 1.

Comparison of heights of mothers in two nursing homes and in two maternity hospitals.

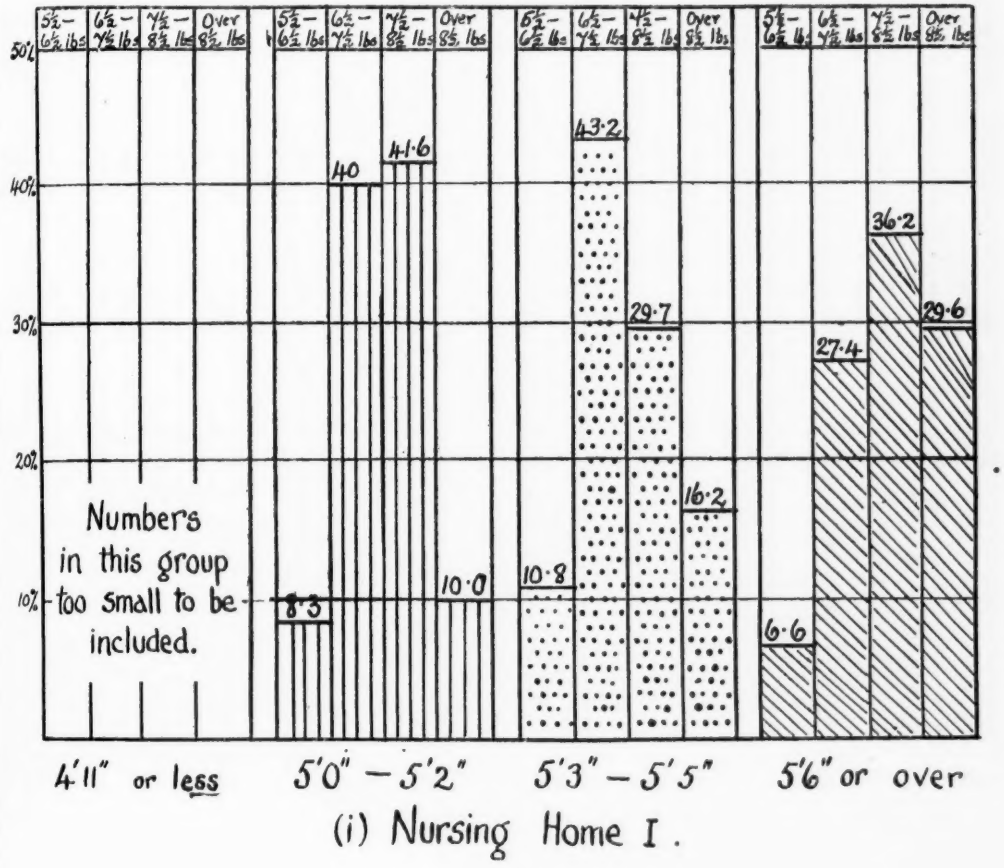

FIG. 2.

Comparison of weights of baby in relation to height of mother in: (i) Nursing home, and (ii) Aberdeen Maternity Hospital (See also Fig. 3).

particular virtue in the child at birth being very large, but there is no doubt that many of the babies in group (c) weighing $7\frac{1}{2}$ pounds or less are lacking in vitality. There is also the question of prematurity. It is known that premature birth is almost twice as common in group (c) as group (a). In group (c) it has been shown that in 50 per cent of the cases of prematurity the cause is unknown, and in 19 per cent of these the pregnancy is full time by dates, and within 14 days of full time in other 15 per cent. These cases were not included in the above chart, but if they had been, they would have further accentuated the difference in the weight of the babies in groups (a) and (c).

If the mother does not grow to her full height, her pelvis is unlikely to develop fully, so that the child may be too big: The danger of this would be increased if the mother's nutrition during the pregnancy

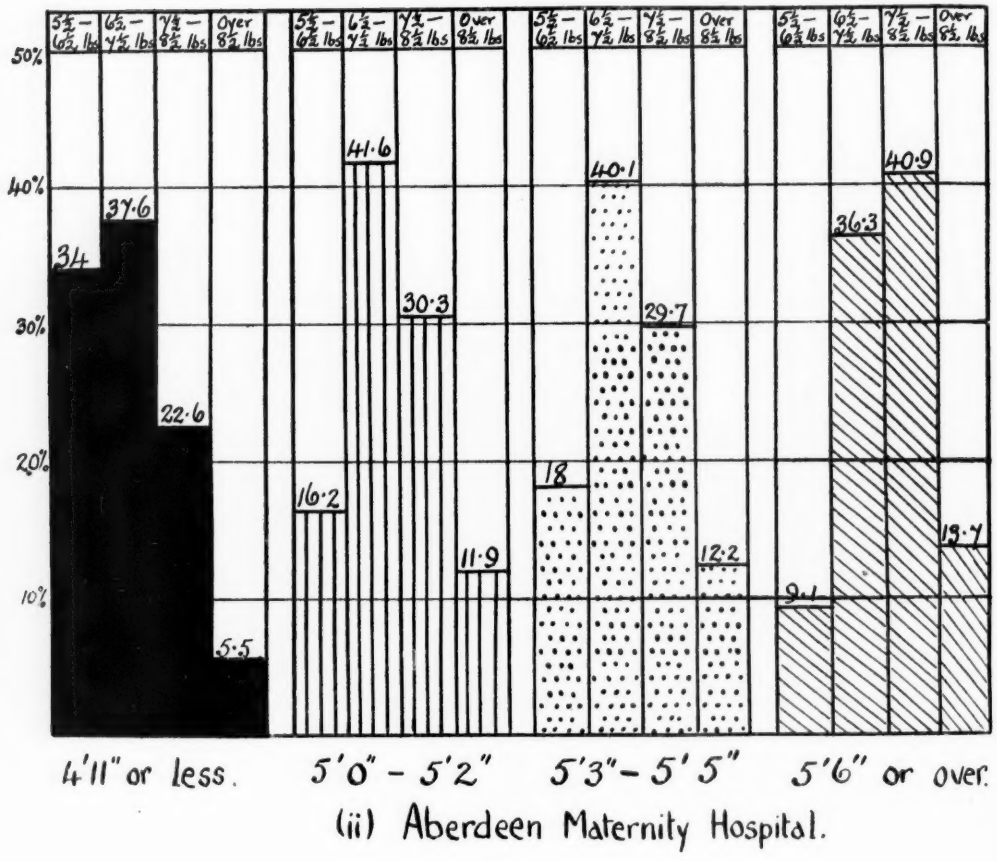

FIG. 3

Comparison of weights of baby in relation to height of mother in: (i) Nursing home, and (ii) Aberdeen Maternity Hospital (See also Fig. 2).

was very good. Table X shows that in the Glasgow Maternity Hospital (d) in women under 5 feet in height 19.4 per cent were delivered by Caesarean section, and in the Aberdeen Maternity Hospital (c) the percentage was 4.3. The forceps-rate was higher in (c) than in (d), possibly because there was such gross contraction of the pelvis in group (d) that Caesarean section was necessary while in group (c) the contraction of the pelvis was less severe and forceps delivery was possible instead. The high forceps delivery rate in group (a) is due to the fact that the forceps is applied much more frequently in private practice, apart from any evidence of maternal or foetal distress. There is plenty of evidence that in the areas where there is a high incidence of rickets a high stillbirth-rate exists. This is probably not due to the high stillbirth-rate in cases of contracted pelvis so much as to the fact that the rickets is accom-

TABLE X.

Shows the Mode of Delivery in: (a) *Nursing Home Cases.* (c) *Aberdeen Maternity Hospital 'Booked' Cases.* (d) *Glasgow Maternity Hospital 'Booked' Cases.*

	Group (d)				Group (c)				Group (a)			
		Caesarean section		Forceps		Caesarean section		Forceps		Caesarean section		Forceps
	No.	No.	Per cent	No. Per cent	No.	No.	Per cent	No. Per cent	No.	No.	Per cent	No. Per cent
Under 5 feet	216	42	19.4	19 8.8	141	6	4.3	23 16.3	4	2	50	2 50
5 feet to 5 feet 2 inches	344	10	2.9	29 8.4	468	5	1.1	49 10.5	60	2	3.3	21 35
5 feet 3 inches to 5 feet 5 inches.	193	2	1.0	17 8.8	344	3	0.9	31 9.0	218	0	0.0	63 28.9
5 feet 6 inches +	29	0	0.0	1 3.4	66	0	0.0	8 12.1	91	0	0.0	37 40.7
All heights	782	54	6.9	66 8.4	1019	14	1.4	111 10.9	373	4	1.1	123 33.0

panied by other signs of poor physique and health. In the periods 1939–41 the stillbirth-rate in Greater London was 30, in Aberdeen 36 and in Glasgow 44. It has been shown that the women attending the hospital clinics in Aberdeen are taller than those in Glasgow. The contrast between Glasgow and London can be gathered from the experience of Kenny[11] and MacLennan.[12] The former found only 5 cases of typical rickety pelvis in 10,000 hospital patients in London. Only 1 of these was a London woman; the other 4 came from the depressed areas of the North, Clydeside, South Wales and Ireland. MacLennan, on the other hand, in Glasgow found 15 per cent of 1,049 suffered from contracted pelvis. Kenny dealt almost exclusively with anomalies in the shape of the pelvis while MacLennan disregards this as being relatively unimportant in Glasgow in view of the large amount of contraction due to rickets. Kenny had 35 stillbirths or early neonatal deaths out of 1,000 cases of difficult labour. This is no more than the stillbirth-rate for the whole country, and only 1 of these deaths was attributed to trauma, whereas MacLennan had a stillbirth-rate alone of 167 in cases of contracted pelvis, and when those delivered by Caesarean section are excluded, the stillbirth-rate for those delivered by the vaginal route was 222. The Glasgow Maternity Hospital admits many emergency cases, so that these figures cannot be used as a cross section of the city, but they give some indication of the amount of rickets, and by implication the amount of poor health and physique. A similar indication comes from a study of Glasgow children. According to Graham,[13] if 3.5 mg. per 100 ml. for serum phosphorus were taken as the lower limit of normal, the percentage showing a low serum phosphorus among 300 cases admitted to the Glasgow Sick Children's Hospital would be 66.5 per

cent. He concludes that at least one-quarter of the infants admitted to the Sick Children's Hospital in Glasgow suffer from some degree of rickets.

Maternal Diet.

During 1942 a record was made by Cameron and Graham[14] of the food intake of 300 women attending the Glasgow Maternity Hospital, made up as follows: 100 mothers of stillborn infants; 100 mothers of premature born infants, and 100 mothers of full-time infants. The average daily caloric intakes in these groups were 1,644, 1,710 and 1,946 respectively. The diet of the mothers with full-time infants was superior in every respect, particularly in first-class protein, calcium and phosphorus.

The diets of a series of 500 women attending the antenatal clinic at the same hospital were supervised during the last 3 months of pregnancy. To serve as contrast the records of 500 women attending the antenatal clinic during the same period, but whose diets were not supervised, were used. Both groups were "booked" cases. In the supervised group there were 21 stillbirths and 31 premature labours. In the control group there were 36 stillbirths and 50 premature labours. In the supervised group 357 infants were breast-fed at the time of dismissal, while in the control group only 276 were breast-fed.

The fact that in the control group the stillbirth-rate was equivalent to 72 and the prematurity-rate was 10 per cent, demonstrated the poor state of nutrition of the women attending the clinic. The fact that the diets varied from 1,644 calories to 1,946 calories shows how far they fell short of the optimum of 2, 500. Even the stillbirth-rate of 42 in the supervised group is high since the stillbirth-rate for 1943 for the whole of Scotland was 36. Graham draws attention to the ignorance of many of the patients with regard to food values and nutrition generally. It is scarcely surprising therefore that the stillbirth-rate in Glasgow during this time was 44. The report of the Joint Council of Midwifery,[15] the paper of Ebbs, Tisdall and Scott,[16] and the survey of the People's League of Health[17] all point in the same direction, namely to the importance of nutrition in the prevention of stillbirths and premature labour. The great difficulty about experiments in human nutrition is that if careful dietary surveys are made, only small numbers can be dealt with, which makes it difficult to draw conclusions as to stillbirth-rates. If large numbers are taken, it is difficult to obtain accurate *data* about food intakes, and it is difficult to ensure adequate controls.

The War Years.

Stillbirth-rate.

Since the war began there has been a striking fall in the stillbirth-rate in both England and Wales and Scotland. In England and Wales the stillbirth-rate in 1928–30 was 40. In 1936 the rate was still 40. By 1939 it had fallen to 38. In Scotland stillbirths did not become notifiable till 1939, in which year the rate was 42. For 10 years till the war, therefore, there had been very little change in the stillbirth-rate in England, and it is possible that in Scotland the rate was also stationary. Since then the stillbirth-rate has fallen steadily in both countries, in England from 38 to 28 (provisional) in 1944, and in Scotland from 42 in 1939 to 32 in 1944. In England analysis shows that this fall affects all age groups and all parities. For example, between 1938 and 1942 the stillbirth-rate in legitimate births to women under 25 fell from 27 to 24, between 25 and 34 years from 34 to 30, from 35 years onwards from 56 to 47. In first births the rate

fell from 41 to 34, and in a 9th pregnancy and over it fell from 62 to 56.

In Scotland (Table XI), the stillbirth-rates are shown for legitimate births in 1938, and in brackets after them are the corresponding figures for 1943. They show that there has been a fall in each age group and in each parity. This has been remarkedly uniform, and it suggests some national factor which has operated since the war and not before it. The most likely factor is the improvement in the national diet among the poorer sections of the community who contribute most of the children. It has been suggested that the fall is due in part to the younger age of marriage, but an analysis of Aberdeen figures fails to show any significant change in the age grouping of the women having children during the war years, so that this factor probably plays a very small part in the fall in the stillbirth-rate. Figure 4 shows that the stillbirth-rate has fallen in the large cities in Scotland especially since 1942, with the exception of Dundee.

National figures for causes of stillbirths are not available such as those for neo-natal and infant mortality, and one of the first attempts made to make such an analysis was that of the Registrar General for Scotland in his annual report for 1939. In Table XXVIII he makes a detailed analysis of 3,832 stillbirths with a total stillbirth-rate of 42.3, and he makes the following comments: "Of the broad groups, the largest number is contained in the ill-defined and unknown. Of the total 3,832 stillbirths, the cause is ill-defined in 901 and is stated to be unknown in 362 cases. Part of this high proportion of ill-defined and unknown causes is, no doubt, due to the novelty of the scheme and will doubtless be reduced as the value of specification of stillbirths by cause becomes apparent. For instance, in the group of ill-defined causes, 341 are ascribed to asphyxia, some of which are probably due to difficulties of delivery of various kinds; macerated foetus (175), of which in some cases the cause (toxaemia, syphilis, etc.) may have been known to the certifier. It will be noted that the 362 cases in which it was definitely stated that an obvious cause was not apparent represent nearly one-tenth of all stillbirths. If no

TABLE XI.

Stillbirths (Legitimate) per 1,000 Children Born, by Age of Mother and Number of Previous Children, 1938.

(Figures in brackets, 1943.)

(Annual Report of Registrar-General for Scotland, 1939.)

Number of previous children	All ages	Age of mother					
		Under 20	20–24	25–29	30–34	35–39	40 and over
0	49 (36)	29 (19)	37 (27)	48 (35)	62 (52)	98 (73)	95 (72)
1	30 (25)	32	21	29	35	46	38
2	32 (31)	19	16	27	45	42	60
3	41 (35)	—	27	31	44	58	80
4	43 (41)	—	35	25	45	61	60
5	43 (52)	—	25	30	38	52	72
6	53 (49)	—	—	35	38	66	78
7	59 (57)	—	—	30	33	68	91
8	58 (77)	—	—	—	48	49	96
9	61 (57)	—	—	—	26	66	82
10 and over	86 (97)	—	—	—	30	106	90
Total	42 (35)	29 (19)	29 (24)	36 (28)	46 (39)	62 (54)	77 (76)

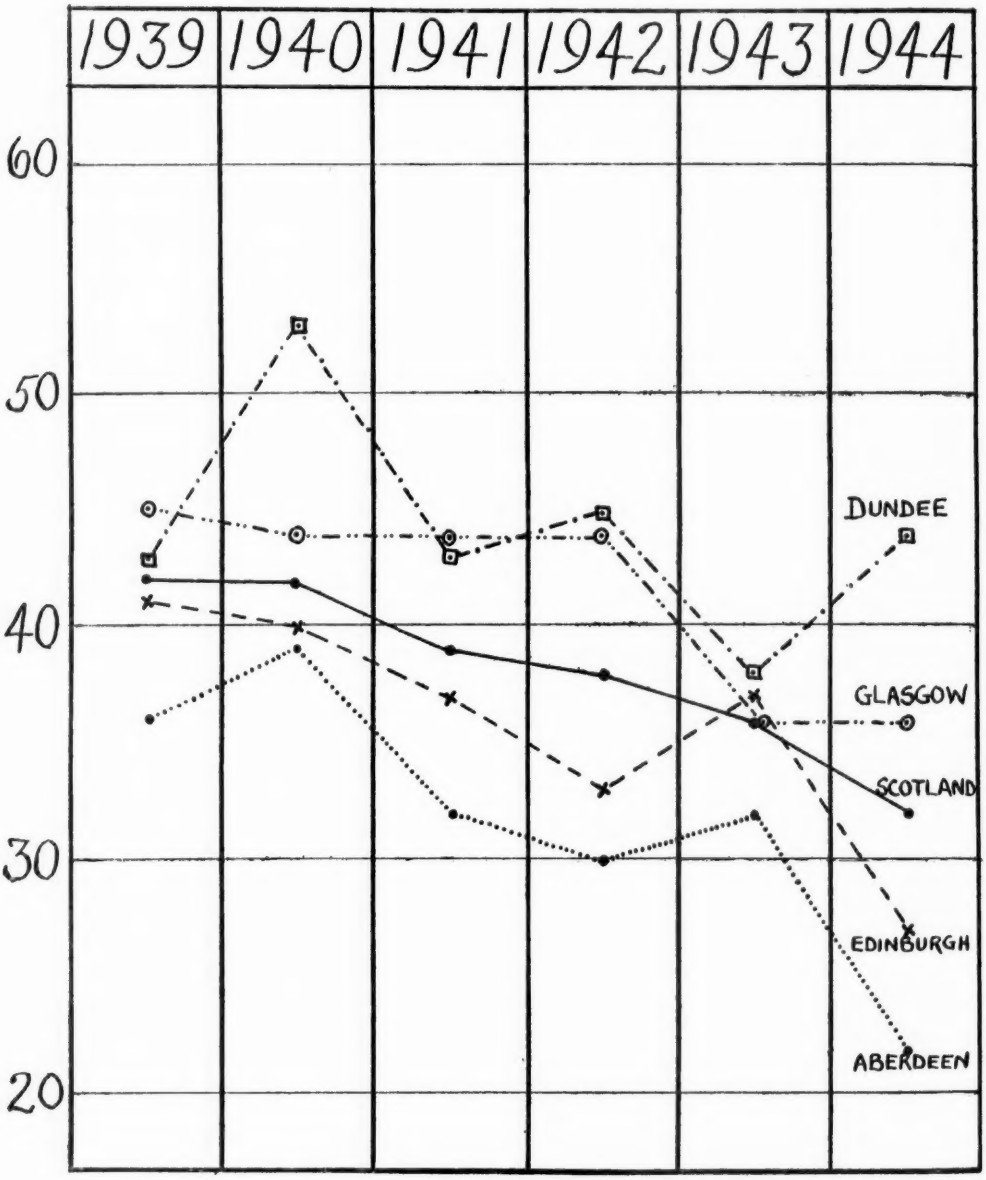

FIG. 4

Shows the stillbirth-rate in Scotland and the four large cities during the war years.

large part of this group is attributable to detectable causes, and therefore not likely to be reduced by more accurate recording on the certificate of the cause of death, the size of the group is of itself evidence sufficient to show the need for investigation of the factors leading to stillbirth before any hope of improvement can be entertained."

In "Infant Mortality in Scotland,"[18] an attempt is made to divide the 3,832 stillbirths referred to above into those due to the hazards of birth and those due to conditions pre-existing at birth, and it was found that 38 per cent could be classified as hazards of birth and 62 per cent due to conditions pre-existing at birth. In view of the absence of published national figures the Aberdeen figures have been analysed in much the same way for the war years to see in which categories the fall in the death-rate has occurred. The details of cases in 1939 are not available, but since then fairly accurate *data* are available, since a high proportion of stillbirths occur in the maternity hospital where postmortem examination is performed as a routine, and care is taken to collect clinical *data* about those dying at home or in nursing homes. The first point which is apparent from Table XII is that if the experience in Aberdeen is typical of Scotland as a whole, the estimate that 38 per cent of stillbirths are due to hazards of birth is too high. It is more probable that not more than 25 per cent of stillbirths are due to hazards of birth and 75 per cent are due to conditions pre-existing at birth. Table XII shows that when the mortality in 1940 is compared with 1944 there has been a striking fall in the number of stillbirths due to unknown factors, trauma and toxaemia. The only other cause of stillbirth which is important numerically is that due to foetal deformity, and here the fall in mortality has been much less. The remaining groups are too variable and too small in numbers to have any conclusions drawn from them. Forty cases are included in the group intercurrent disease and miscellaneous, and they were grouped as follows: syphilis 12, severe anaemia 6, diabetes 4, bowel complication 6, influenza and pneumonia 3, complications of twins 3, severe heart disease 2, pyelitis 2, Rh factor 2. Despite postmortem examinations and fairly accurate certification, 33 per cent of the total stillbirths in the 5 years are classified as "cause unknown," and this is the biggest individual group. The mortality in this group has been reduced by nearly 50 per cent, so that this represents a big saving in infant lives. The most likely explanation of this is better nutrition of the mother. The reduction in the death-rate from toxaemia has been just as great, and from trauma very considerable, although it must be remembered that in the neonatal period there has been no fall in the death-rate from trauma. The stillbirth-rate due to trauma among those delivered in hospital as booked cases has fallen, and in those delivered outside the hospital or admitted as emergency cases, there has been a similar fall in the death-rate from trauma. It may be that the fall in the stillbirth-rate from trauma is to some extent due to improved management of pregnancy and labour, but it seems more likely that it results from better nutrition of the mother, acting by improving the vitality of the infants so that they stand up better to the strain of difficult labour. It has been shown that toxaemia is less common in the better nourished section of the community, so that the fall in the stillbirth-rate due to toxaemia may again be due to improved nutrition of the mother.

Neonatal Mortality.

In contrast to the steady fall in the stillbirth-rate throughout the war years the neonatal mortality in both England and

TABLE XII.

Showing the Causes of Stillbirth, Year by Year from 1940 to 1944 in the City of Aberdeen.

Causes of stillbirth	1940		1941		1942		1943		1944		Total		
	No.	Death-rate per 1000 births	No.	Death-rate per 1000 births	No.	Death-rate per 1000 births	No.	Death-rate per 1000 births	No.	Death-rate per 1000 births	No. of stillbirths	Per cent of total	1944 as percentage of 1940
Cause unknown	36	12.8	41	14.1	26	8.9	32	11.1	20	6.7	155	33.4	52
Trauma	26	9.3	17	5.8	21	7.2	17	5.8	17	5.7	98	21.1	61
Toxaemia	16	5.7	14	4.8	19	6.5	17	5.8	8	2.7	74	15.9	47
Accidental haemorrhage	5	1.7	7	2.4	7	2.4	8	2.7	5	1.7	32	6.9	100
Deformity	12	4.2	11	3.7	14	4.8	10	3.4	10	3.4	57	12.3	81
Miscellaneous intercurrent diseases	13	4.6	5	1.7	5	1.7	14	4.8	3	1.0	40	8.6	22
Placenta praevia	4	1.4	3	1.0	0	0.0	1	0.3	0	0.0	8	1.7	—
All causes	112	39.9	98	33.7	92	31.6	99	33.9	63	21.1	464	99.9	52
Total births	2804		2907		2904		2889		2989				

Wales and Scotland rose during the years 1940 and 1941, and then fell steadily to below the pre-war level. In England the figures from 1938 to 1943 were 28.30, 28.27, 29.61, 29.00, 27.23, 25.22, and in Scotland to 1944, 35.7, 36.5, 37.2, 39.9, 35.1, 32.9, 32.8. In the period 1–12 months there was an even greater rise, in England the highest peak was 31.04 and in Scotland 43. This rise was due to rise in the mortality from infection. Table XIII is an analysis of the neonatal mortality in England and Wales in the years 1938 to 1943. It shows that when 1943 is compared with 1938 the mortality from prematurity, birth trauma and congenital debility has fallen. The fall took place after 1941. The only obstetrical cause of death which has not fallen is congenital malformation. The death-rate from infection, both diarrhoea and pneumonia, is raised. The same is found in Scotland. (Table XIV.) The death-rate from infection rose in the years 1940–42 and fell as in England and Wales, while as in England and Wales there was a fall in the death-rate from prematurity and congenital debility. In both countries the most striking fall in the death-rate from prematurity, congenital debility and trauma occurred in 1943.

TABLE XIII.

Neonatal Mortality in England and Wales by Year and Cause of Death.

Cause of death	1938	1939	1940	1941	1942	1943	1943 as percentage of 1938
Prematurity	13.83	13.65	13.66	13.65	12.80	12.03	86
Birth injury	2.62	2.70	2.66	2.47	2.49	2.29	87
Congenital malformations ...	3.85	3.87	4.21	4.07	4.11	3.67	95
Congenital debility	1.06	1.05	1.12	1.02	0.83	0.61	57
Enteritis and diarrhoea	0.42	0.41	0.59	0.47	0.61	0.53	125
Bronchitis and pneumonia ...	1.07	1.17	1.52	1.68	1.33	1.33	
Other causes	5.45	5.42	5.85	5.64	5.06	4.76	87
All causes	28.30	28.27	29.61	29.00	27.23	25.22	89

It has been pointed out that the cause of death cannot be ascertained accurately without postmortem examination, and also in the conditions of practice at the moment clinical observations are often so scanty that a diagnosis is difficult to make. The diagnosis of congenital debility, for example, is not satisfactory and some infants are certified as dying of prematurity when the cause is infection. At the same time the same error applies year by year, so that changes occurring are of significance. Also a postmortem examination may explain how the child died but not why. It is important to obtain a postmortem examination when possible, but it does not always indicate how effective preventative measures can be instituted. To get over to some extent this difficulty of certification, the neonatal deaths in the city of Aberdeen have been arranged in two ways, according to the certified cause of death and according to the day of death. It is well known that, as a rule, if death occurs within a day or two of birth, the cause is obstetrical and connected with the pregnancy or labour, while later most of the deaths are due to infection. In 1939 in Aberdeen only 33 per cent of neonatal deaths occurred in hospital, but by 1943 the proportion had reached 80 per cent, so that a high degree of accuracy of certification was possible.

Table XV gives the neonatal deaths according to the certified cause of death, and it shows that the rise in the neonatal death-

rate in 1940 and 1941 was largely due to increase in infection and to a lesser extent to atelectasis, congenital malformations and to prematurity.

TABLE XIV.

Neonatal Deaths in Scotland 1937–1943.

Cause of death	Death-rate for 1,000 live births			1943 as a percentage of 1937–39
	1937–39	1940–42	1943	
Principal infections, Erysipelas, Tuberculosis, Syphilis, Convulsions	0.64	0.69	0.64	
Pneumonia	1.58	1.95	1.61	
Other respiratory infections	0.63	0.64	0.38	
Diarrhoea	1.14	1.34	1.19	
Total	3.99	4.62	3.82	95
Congenital debility	4.76	4.14	2.81	71
Premature births	15.81	15.66	13.66	86
Injury at birth (trauma)	3.25	3.58	2.82	86
Congenital malformations	3.99	4.16	4.07	102
All other causes	4.83	5.24	5.74	118
Total	36.63	37.40	32.92	89

Table XVI shows the neonatal mortality in Aberdeen arranged according to the day of death, and this shows that in the years 1940 and 1941 the death-rate in the period 7 to 28 days was 3 times that of 1938 and 1944. There was no rise in the mortality in the first 3 days of life with the exception of 1942, when there was an unusually large number of deaths in premature babies. This was also probably the period of greatest war strain. When 1938 is compared with 1944 we see from Table XV that the death-rate in respect of prematurity is 15.9 instead of 10.9. The death-rate from from congenital debility has fallen from 3.8 to 1.4. Table XVI shows that when 1944 is compared with 1938 the fall is largely in respect of deaths in the first day of life—15.4 in 1944 compared with 20.0 in 1938, or if the first 3 days are taken together—20.2 compared to 25.5, that is to say the 1944 figure is 79 per cent of that for 1938. In the period 7 to 28 days the mortality in 1944 was 98 per cent of that in 1938. The improvement in the neonatal mortality from 34 in 1938 to 28 in 1944 is due to a lowering of the mortality from obstetrical factors. There has not been any improvement in the environmental factors leading to a lowering of the death-rate from infection.

Fig. 5 consists of graphs of the neonatal mortality for Scotland and the four principal cities, and it shows that in Scotland as a whole and in the cities individually, with the exception of Edinburgh, there was a rise in the neonatal mortality in the years 1940 and 1941. In Aberdeen this rise has been shown to be due to increased mortality from infection, and while the mortality from both gastro-enteritis and respiratory infection rose, there are three times as many deaths from the latter as the former, so that the variation in the mortality in

TABLE XV.

Mortality in the First Month of Life in Aberdeen, 1938 to 1944, arranged by year and Certified **Cause of Death.**

Cause of death	1938		1939		1940		1941		1942		1943		1944		Total		
	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	1944 as percentage of 1938
Congenital malformation	6	2.1	5	1.7	13	4.8	16	5.7	13	4.7	9	3.2	12	4.1	74	3.7	195
Prematurity	46	15.9	50	17.4	51	18.9	53	18.8	62	22.3	44	15.8	32	10.9	338	17.1	68
Congenital debility ...	11	3.8	8	2.8	7	2.6	6	2.1	0	0.0	3	1.1	4	1.4	39	2.0	36
Birth injury	10	3.4	14	4.9	11	4.1	11	3.9	7	2.5	13	4.7	10	3.4	76	3.8	100
Infection	10	3.4	10	3.5	20	7.4	27	9.6	9	3.2	20	7.2	11	3.8	107	5.4	112
Atelectasis	6	2.1	8	2.8	11	4.1	10	3.6	4	1.4	12	4.3	8	2.7	59	3.0	128
Jaundice and haemorrhagic diseases	7	2.4	2	0.7	3	1.1	3	1.1	7	2.5	4	1.4	5	1.7	31	1.6	116
Others	3	1.0	5	1.7	4	1.5	2	0.7	2	0.7	6	2.2	1	0.3	23	1.2	170
All causes	99	34.1	102	35.5	120	44.5	128	45.5	104	37.3	111	39.9	83	28.3	747	37.8	83
Total live births	2900		2870		2692		2812		2779		2779		2926		19,758		

TABLE XVI.

Mortality in the First Month of Life in Aberdeen arranged according to Age at Death for the Years 1938 to 1944.

Day of death	1938		1939		1940		1941		1942		1943		1944		Total			
	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	Deaths	Deaths per 1000 live births	1944 as percentage of 1938	
1 day	58	20.0	54	18.8	56	20.8	59	21.0	66	23.7	54	19.4	45	15.4	392	19.8	77	
2 days	7	2.4	15	5.2	7	2.6	8	2.8	10	3.6	15	5.4	10	3.4	72	3.6	141	79
3 days	9	3.1	2	0.7	6	2.2	5	1.8	3	1.1	2	0.7	4	1.4	31	1.6	45	
4–7 days	8	2.8	9	3.1	11	4.1	11	3.9	8	2.9	6	2.2	7	2.4	60	3.0	85	
7–28 days	17	5.9	22	7.7	40	14.9	45	16.1	17	6.1	34	12.2	17	5.8	192	9.7	98	
All causes	99	34.2	102	35.5	120	44.6	128	45.6	104	37.4	111	39.9	83	28.4	747	37.7	83	
Total live births	2,900		2,800		2,692		2,812		2,779		2,779		2,926		19,758			

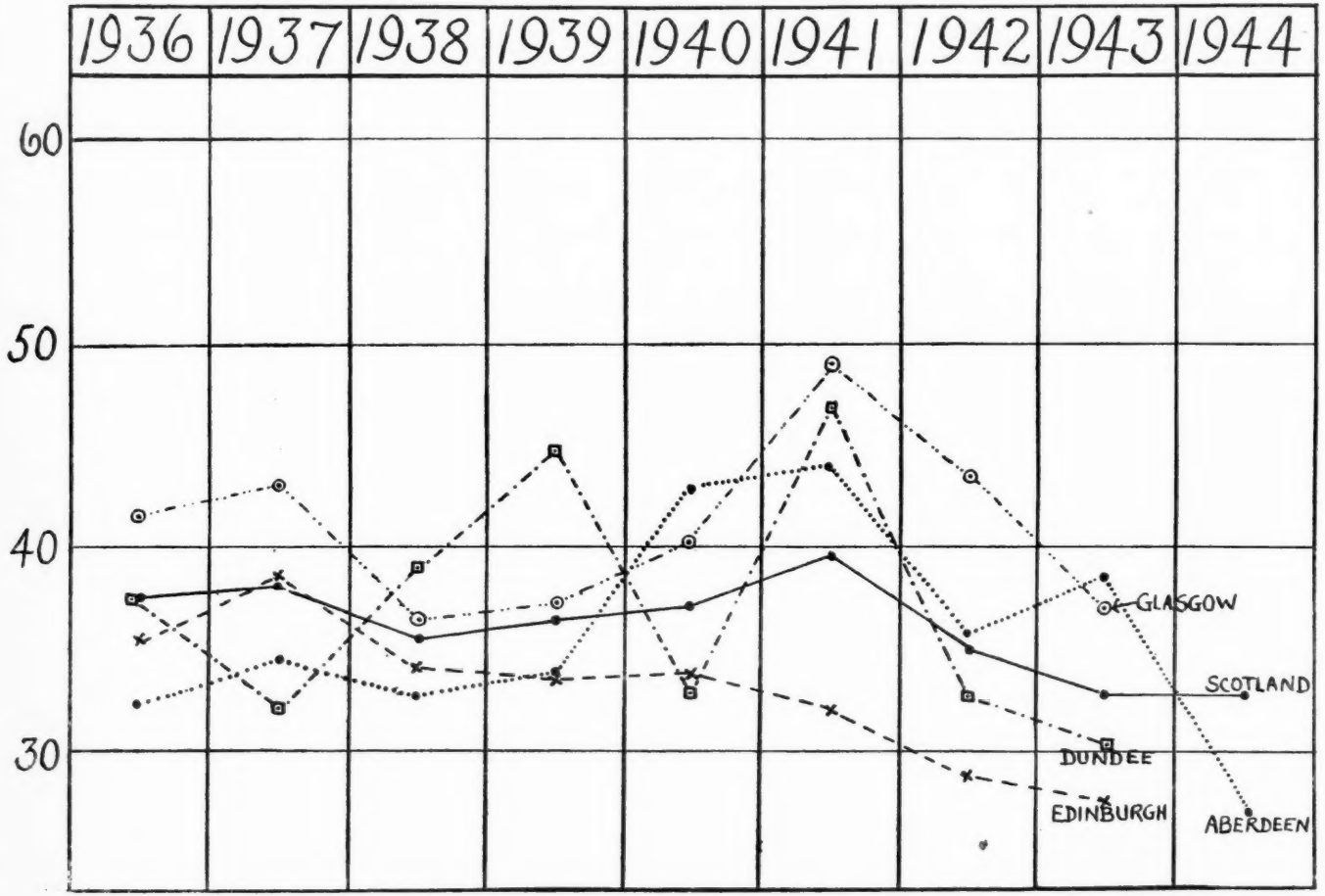

FIG. 5.

Shows the neonatal mortality in Scotland and the four large cities from the year 1936 to 1944.
The neonatal mortality-rates for Dundee, Edinburgh and Glasgow, in 1944, were as follows: Glasgow, 43; Edinburgh, 28; Dundee, 32.

Shows the neonatal mortality in Scotland and the four large cities from the year 1936 to 1944.

The neonatal mortality-rates for Dundee, Edinburgh and Glasgow, in 1944, were as follows: Glasgow, 43; Edinburgh, 28; Dundee, 32.

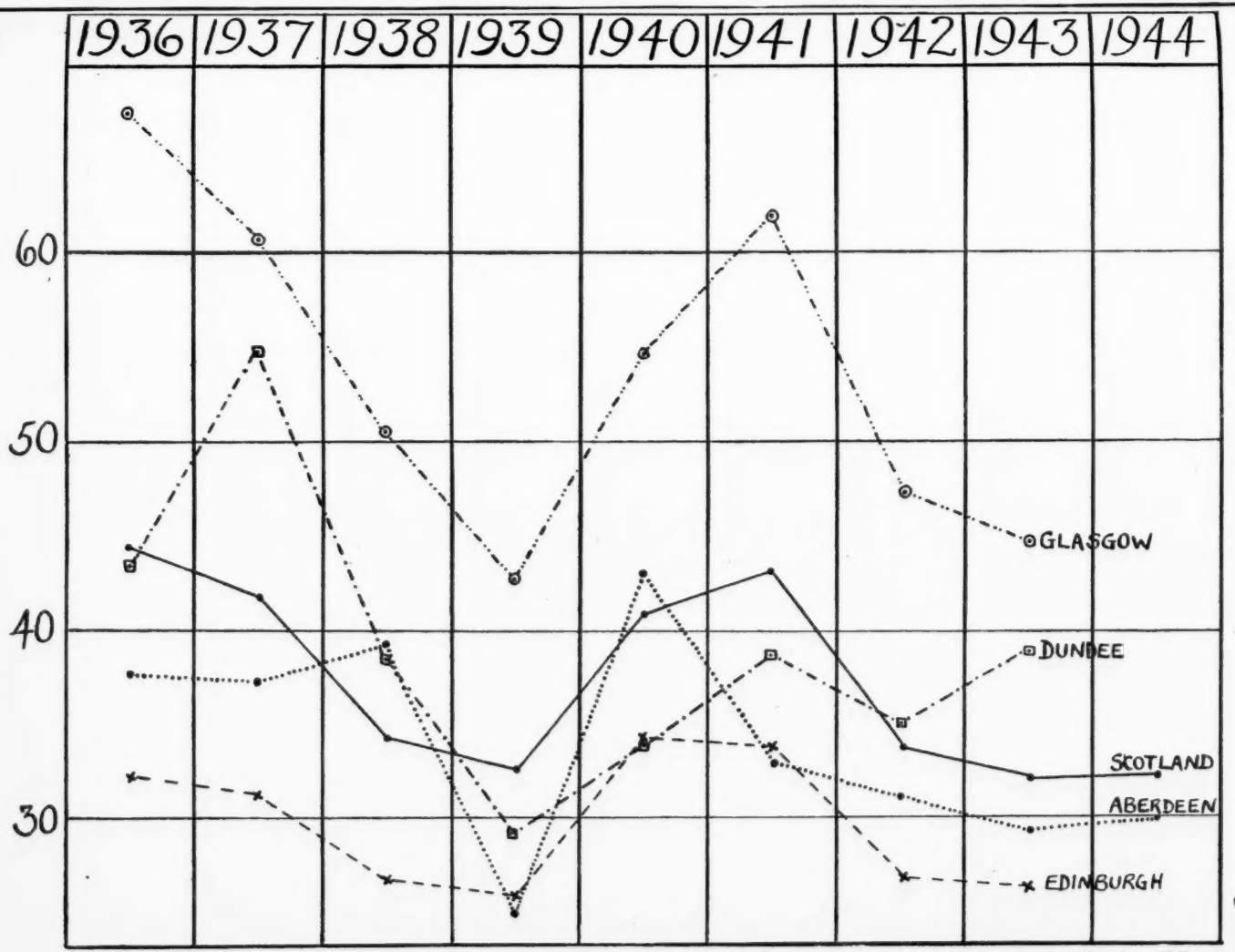

FIG. 6.—Shows the mortality in Scotland and the four large cities in the period 1 to 12 months. The death-rates for Dundee, Edinburgh and Glasgow, in 1944, were as follows: Glasgow, 52; Edinburgh, 23; Dundee, 28.

the period 7 to 28 days is largely due to fluctuations in the deaths from respiratory infection. Fig. 6 shows the mortality in the period 1 to 12 months in Scotland and the four large cities, and again the sharp rise in 1940 and 1941 with the subsequent fall is seen. In this case also the mortality figures for Edinburgh are the most satisfactory, the rise in mortality in 1940 and 1941 being small compared to the others. The figures leave no doubt that the rise in the total infant mortality in the years 1940 and 1941 was due to increase in infection. This rise was due to deterioration in living conditions resulting from the war and was greatest in those areas where the living conditions before the war were worst.

During the years 1938 to 1944 the mortality in Aberdeen in the period under one day was 19.8, in the 2nd day 3.6, in the 3rd day 1.6; in the period 4 to 7 days 3.0, in the period 7 to 28 days 9.7. During the same years among 1,383 nursing home cases the mortality on the 1st day was 7.2, the second day 5.0, the 3rd day 0.0; the period 4 to 7 days 0.0, and the period 7 to 28 days 0.72. The greatest difference between the two groups is therefore in the period after the 3rd day. In the period 7 to 28 days the mortality in the city generally is more than 10 times that in the small nursing home group. In the first 3 days the mortality in the city as a whole is only twice that for the nursing home cases. The low mortality of 0.72 per 1,000 in the period 7 to 28 days in nursing home patients even in war time illustrated how much better are the environmental conditions in this group.

Summary of Statistical Analysis.

For some years before the war the stillbirth-rate in England and Wales had remained stationary and, since the trend of mortality-rates in Scotland and England and Wales is the same, the probability is that the stillbirth-rate in Scotland had also been stationary for some years before the war. Since 1939 the rate has fallen steadily in both England and Wales and Scotland. It has been shown that for Aberdeen at any rate the fall has been in the categories "cause unknown," trauma and toxaemia, and there has been no fall in deaths due to foetal deformity. The most dramatic fall has been in 1944. In 1940 and 1941 in both countries the neonatal mortality rose, but since then has fallen to a lower level than in 1939. This rise was in the part of neonatal mortality due to infection. The mortality in that part due to obstetrical factors similar in etiology to stillbirths has fallen steadily. The fact that the neonatal mortality in both countries is smaller in 1944 than in 1939 is due to the diminution in the death-rate from prematurity, congenital debility and trauma. The death-rate from infection is about the same as the pre-war figure. With regard to the period 1 to 12 months the death-rate in England and Wales for 1943 had not quite reached the figure for 1939, and in Scotland it had reached it.

If all the stillbirths and neonatal deaths occurring in the first 3 days of life were added together they represent roughly all infants' deaths due to obstetrical factors, while those occurring from the 4th to the 28th day represent, with few exceptions, deaths due to infection. When these two groups are compared in Aberdeen we find that the death-rate in the period up to 3 days in 1944 was 69 per cent of that in the year 1939, while in the period 4 to 28 days the mortality in 1944 was 94 per cent of that in 1938. (1938 was taken when considering the period 4 to 28 days since it was the last pre-war year, and the mortality in 1939 had begun to rise. On the other hand, the figure for stillbirths was not available for 1938, although there is reason

to believe that it would have been about the same as that for 1939.) When the obstetrical group is split up we find that the causes of death which have fallen most are prematurity, 'cause unknown' and congenital debility. The first two groups are by far the largest causes of death in this period. There has been a much smaller fall in deaths due to birth trauma and a rise in those due to foetal deformity. There are no national figures of stillbirths available from which a similar analysis can be made, but analysis of neonatal deaths suggests that the Aberdeen experience is typical of the country as a whole. The difference in neonatal mortality between the Social Classes is greatest in respect of prematurity and congenital debility, and least in respect of birth trauma and congenital malformations. It can be inferred, therefore, that the war has improved the social position of Classes III, IV and V, in so far as it affects women in these classes having fewer stillbirths and deaths in the first 3 days of life from prematurity and 'unknown causes.' Improved nutrition of the mother during pregnancy seems to be the most likely explanation. This improvement has affected the whole country and every age group and parity, so that it is likely to be due to the better distribution and consumption of milk and other foods important for health. The rise in the death-rate in the period 4 to 28 days (due to infection) in the critical years of the war was probably due to evacuation, black-out, bombing and associated conditions, and the fact that the mortality in 1944 is very little better than that in 1938 is what one would expect since living conditions have not yet improved compared to pre-war standards.

Wartime Diet.

There is substantial evidence that improvement in the diet of a large mass of the population has occurred since the war began. According to official sources,[19] in 1940 and 1941 there was a sharp fall in food supplies, particularly of meat, visible fats, sugar and fruit, which greatly reduced the palatability as well as the nutritional level of the diet. The 1942 figures show an improvement largely resulting from Lend-Lease supplies, and from then onwards supplies have remained remarkably constant. A satisfactory feature of the British position has been the improved supplies of vitamins and minerals resulting mainly from increase in the extraction ratio of flour and increased supplies of vegetables and milk. Table XVII shows a rise in the average consumption of liquid milk and cheese, potatoes, leafy vegetables and bread, and a fall in total fats and meat. These figures for the United Kingdom although striking, do not bring out the great improvement among the poorer sections of the community. This applies particularly to Scotland where before the war poverty and unemployment were much worse than in England. Many of the workers in heavy industries before the war were unemployed. In the period 1934–36 over 20 per cent of the insured population in the towns of the West of Scotland were unemployed. Dietary surveys made at that time and referred to at the beginning of this paper, showed that the diets were deficient in every constituent examined. Among those who were in employment the diet was better, but was deficient particularly in minerals and vitamins. Since the war unemployment has disappeared and wages are higher, and during the years 1941, 1942, and 1943 dietary surveys were made of families of heavy workers in Glasgow, Edinburgh and Lanarkshire. The results are unpublished, but in a personal communication from the Rowett Institute it is learnt that even in 1941 the diets showed more calories, more protein, more fat, more calcium, iron and

TABLE XVII.

Summary of Changes in Civilian Consumption of Foods.

1934–38 to 1943–44.

("Food Consumption Levels in the United States, Canada and the United Kingdom." Report of a Special Joint Committee set up by the Combined Food Board. H.M. Stationery Office, London, 1944.)

	Percentages of 1934–38 level					
	1934–38	1940	1941	1942	1943	1943–44
Liquid milk	100	106	121	130	134	136
Cheese	100	99	106	127	128	127
Meat (edible weight)	100	86	76	80	76	78
Poultry, game and fish	100	74	67	68	61	62
Eggs (including dried egg)	100	93	75	84	91	103
Butter	100	54	41	32	31	30
Margarine	100	171	199	197	192	193
Total fats	100	89	88	88	84	83
Sugar, jam, honey	100	74	67	69	69	70
Potatoes	100	101	116	140	144	144
Pulses and nuts	100	70	76	68	59	64
Tomatoes and citrus fruits	100	67	36	60	50	50
Other fruits	100	81	52	75	56	59
Leafy, green and yellow vegetables ...	100	99	113	127	134	134
Other vegetables	100	85	105	126	132	132
Flour, barley, oatmeal, etc.	100	107	121	116	117	118

vitamins that the corresponding class in 1936–38. Compared to the very poor diet in unemployed families in the period 1934–36, the improvement was even more striking. Families of Forces dependants in Dundee and Aberdeen were also surveyed, and while the diets were not quite so good as in the dependants of heavy workers, they were much better than those of the pre-war survey in 1936–38. In 1943 the families of heavy workers were receiving adequate supplies of calories, protein and Vitamin B1, but the diet was deficient in Vitamins A and C, and slightly deficient in calcium. There was an 80 per cent increase in the consumption of liquid milk in the working classes. This is due to a number of factors, better health propaganda, rationing, increased purchasing power and not least the National Milk Scheme, whereby milk can be purchased cheaply or obtained free when necessary. In the families of heavy workers 28 per cent of the milk consumption was under the National Milk Scheme, whereas in the case of Forces dependants the corresponding figure was 80 per cent. This has done a great deal to ensure that Forces dependants whose purchasing power was low compared to heavy workers, were able to have their share of milk. Since the output of liquid milk has increased by only 30 per cent, there has obviously been an altered distribution of the country's milk, so that it is now much more than formerly being consumed where it is most needed. The value of milk as a food lies chiefly in its content of protein of high biological value, its exceptional richness in calcium and its generous supply of Vitamin A, of riboflavin and of other members of the Vitamin B complex. It is almost unique in being a substance designed to satisfy the nutritive demands of rapid growth. It is to be hoped that the Government is prepared to continue and extend its present policy of food subsidies to ensure adequate

consumption of milk. It is calculated that a 50 per cent increase on 1943 production figures for liquid milk is necessary to ensure a reasonable intake for everyone, and this will necessitate a clear farming policy and a vast extension of dairy farming. Table XVII shows that there has been a small increase in the consumption of cereals, but here the improved quality of the war-time bread has made a substantial contribution. Some improvement has resulted at antenatal clinics from the more extensive treatment of anaemia and the giving of orange juice and cod liver oil, and Vitamin A and D tablets. In many cases, however, not more than 30 per cent of the expectant mothers take up these vitamin preparations.

The stillbirth-rate has thus been falling fairly steadily throughout the war years in both Scotland and England and Wales, while that part of the neonatal mortality due to prematurity, congenital debility and birth injury has fallen markedly since 1942. The fall since 1942, although remarkable, is understandable, since by that time the scheme of food priorities was well established and the general war situation was much improved. It is remarkable that from 1939 to 1941 in England and Wales the stillbirth-rate should fall from 38 to 34, and in Scotland from 42 to 39, when so many factors such as bombing, overwork, anxiety and strain were certain to have a deleterious effect on the mothers' health during pregnancy.

It was stated in a previous paper that since in Scotland about 90 per cent of mothers are in the lower income groups the biggest reduction in Scotland's stillbirth and neonatal mortality-rates would result from improvement in social and economic conditions. The wartime experience is very encouraging, and suggests that with further improvements in nutrition and obstetrical care generally a further substantial fall in the stillbirth and neonatal mortality-rates will occur. Under ideal conditions the stillbirth-rate need not be more than 10, so that there is still much to be done. How far the rate of 22 in Aberdeen in 1944 is due to faulty diet during pregnancy and could be corrected quickly, and how far it is due to undernourishment in youth resulting in poor physique, which can be corrected only by long term policy, is difficult to say. It has been shown above that many women of the lower Social Classes have poor physique and general health, so that although we may expect continued improvement from better diet and better health services, we cannot attain a minimal rate till all mothers have had the advantage of good food and environment since infancy.

I wish to acknowledge my indebtedness to the Registrar General for England and Wales and the Registrar General for Scotland for information on national *data*, the Medical Officer of Health for Aberdeen for access to records and much valuable material, and to Dr. I. Leitch of the Imperial Bureau of Animal Nutrition and the Rowlett Research Institute for *data* of nutrition surveys and much valuable advice and criticism.

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The Recurrence Rate of Urethral Caruncles

BY

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A SERIES of 85 cases of urethral caruncle, treated over a period of 15 years ending 2 years ago, has been examined to determine the likelihood of a recurrence developing after treatment and the period of time during which a recurrence remains a possibility. The series is not as extensive as it was originally hoped to collect; very often lesions thought to be very common prove rarer than expected at the actual count.

Excision of the caruncle and the caruncle-bearing area of the posterior lip of the urinary meatus was the procedure adopted in 68 cases. In 22 of these cases the caruncle returned, in 18 instances once, in 2 instances twice, in another 3 times, in another 4 times. It would appear then that recurrence of a caruncle will follow excision in about one-third of the cases so treated.

The interval between the excision and the recurrence ranged from 1 year to 15 years, as shown in the following table:

Number of cases.	Interval between excision and recurrence
1	1 year
4	2 years
5	3 ,,
6	4 ,,
2	5 ,,
1	6 ,,
1	7 ,,
1	8 ,,
2	10 ,,
1	12 ,,
1	14 ,,
2	15 ,,

Summarizing the table it will be seen that 17, or 65 per cent of the recurrences occurred within 5 years of the treatment, mainly in the 2nd, 3rd and 4th years, 5, or 18 per cent in the second 5 year period, and 4 or 15 per cent in the third 5 years period. Each recurrence in the 4 cases of repeated recurrence was counted separately so that the total of 27 recurrences is greater than the number of patients.

It will be seen that while more than half the risk of recurrence is past after 5 years have elapsed from the excision it still remains at a significant level even in the third 5 years period. This should induce caution both in giving a prognosis and in assessing the results of any form of treatment as an alternative to excision.

A comparison made between the cases cured by one excision and those in which a recurrence developed failed to reveal any significant differences. The operative technique could not be held responsible; in the recurrent group the first excision had been done by a diversity of surgeons ranging from the first president of the Royal College of Obstetricians and Gynaecologists to a house surgeon. Nor indeed did the presence of an associated lesion seem to have any bearing on the incidence of recurrence. Vaginal prolapse, cervicitis, leucorrhoeas, cystitis, urethritis, were if anything more common in the non-recurrent group than in the recurrent. Undoubtedly a close relation exists between uterovaginal prolapse and cervicitis on the one hand and urethral caruncle on the

other, as the figures of 21 cases of prolapse and 11 of cervicitis in the whole series of 85 cases of caruncle show, but it must be an indirect, not a direct causal nexus, because in 6 cases the caruncle first appeared some years after a vaginal repair had been done, nor indeed did the performance of a repair or a vulvorrhaphy at the same time that the caruncle was excised appear to prevent a recurrence.

In general this high recurrence-rate of one-third after excision is not surprising. An excision does not deal with the causes of a caruncle, nor does it permanently remove the caruncle-bearing area of the meatus. In fact too free an excision may cause a troublesome incontinence of urine which may necessitate a secondary repair.

Does postoperative treatment of any associated infection improve the results of excision? Theoretically the answer should be "yes"; actually however such treatment did not seem to make much difference to the chances of recurrence. The frequent absence of any discernible associated infection and the very long time a recurrence may take to appear make it evident that the causal relation between an infection and a caruncle is far from direct.

The main alternative treatment adopted in the series was coagulation diathermy, and 15 cases were so treated. As yet recurrence has not taken place in these cases and coagulation diathermy would seem accordingly to be a more suitable method than excision. The explanation of this advantage must be that the fibrosis following the coagulation inactivates the caruncle-bearing area of the posterior meatal lip.

An electro-cautery was used to burn off the caruncle base after excision in 6 cases, but recurrence occurred in 3 of these, and it is clear that the effect of a cautery is not deep enough to prove effective.

Radium was used experimentally in 3 cases. In 1 case, that of a typical small caruncle without any discernible cause, a 2 mg. needle, 1.5 cm. long, with a screenage of 1 mm. platinum was inserted longitudinally through the base of the caruncle and left *in situ* for 4 days. It seemed to have no effect whatever, and 3 months later the unaltered caruncle had to be excised. In the 2nd case in which a similar interstitial irradiation was practised the treatment did seem to be effective and the caruncle disappeared, but in this case it was very difficult to get the needle inserted cleanly owing to the softness of the caruncle and the urethral mucosa, and I think the caruncle was destroyed by the mechanical trauma of the insertion rather than by the radium.

The 3rd case was that of a 2-para who had a caruncle removed when she was 50, a second caruncle removed when she was 53, a third caruncle removed when she was 56. All of these were typical caruncles growing from the posterior meatal lip. When I saw her she had a pedunculated caruncle arising from the anterior lip, the only instance in the series of one developing at this site. It was removed and proved to have a typical histological appearance. In view of the repeated return of caruncles in this patient this fourth lesion was treated with a relatively heavy dose of radium, three 1 mg. needles, 1 cm. in length, were inserted interstitially around the anterior lip of the meatus and left *in situ* for 100 hours. The needles were inserted 0.5 cm. apart. This was done 18 months ago and as yet no recurrence has developed. In view, however, of the radio-resistance of the caruncle in the 1st case further trials with radium were abandoned. It would seem that the radio-sensitivity of a caruncle is no greater than that of the urethral mucosa from which it springs, and to gain a successful result with radium means pushing the dose to the limits of tolerance

of the urethral mucosa and incurring the risk of a persistent burn.

There remains finally the question of malignant change as a possible cause of recurrent caruncle. In some textbooks malignant change is alluded to as a possibility. General clinical experience, would seem to discount the occurrence of such a change; moreover a caruncle is so typically benign in its microscopic appearances that any malignant lesion developing in the site of a caruncle must be regarded as a new condition and not a change in the caruncle itself. Certainly in the present series there was no case in which a local new growth developed. It is probable that cases similar to the one described above, in which the caruncle returned several times, have given rise to the belief of some that malignant change does occur.

SUMMARY.

1. Urethral caruncle recurred in 27 cases out of 68 treated by excision.

2. The presence and treatment of an associated lesion such as an infection or a prolapse did not seem to have any bearing on the chances of recurrence.

3. The period for the recurrences to develop ranged between 1 and 15 years, more than half of the recurrences coming within 5 years, particularly in the second, 3rd and 4th years.

4. Recurrence was not seen in any of 15 cases treated by coagulation diathermy.

5. The radio-sensitivity of a caruncle is not greater than that of the normal urethral mucosa and as a primary method of treatment radium is not advisable, though it has a limited scope in the treatment of recurrent caruncle.

A Granulosa Cell Tumour of Tubular or Adenomatous Type

BY

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CLINICAL DETAILS.

IN January 1942 I was consulted by Mrs. N. because of continuous uterine haemorrhage of 17 months' duration. There were no other symptoms except some backache.

She was 22 years of age, had been married 2 years, and there had been a 3-months' miscarriage soon after marriage.

The menarche occurred at the age of 11 years and her menstrual habit was 7/42 until the onset of her present complaint. The previous medical and surgical history was uneventful.

On general examination I found the patient to be a well developed young woman with normal secondary sex characters. She was somewhat anaemic, however, as a result of the excessive bleeding.

Abdominal examination was negative. On vaginal examination the uterus was found to be normal in size, position and mobility, and in the position of the right ovary was a readily palpable solid tumour of about the size of a tennis ball.

A diagnosis of granulosa cell tumour was made and the patient admitted to hospital for treatment.

On opening the abdomen the examination findings were confirmed, but in addition there was evidence of an antecedent pelvic infection in the form of light film-like adhesions about the uterus and appendages. The tumour involved the right ovary and had the corresponding Fallopian tube stretched over it. There were some adhesions between the tumour and the posterior surface of the right broad ligament, but they were readily separated. The uterus and left appendage were of normal appearance except for the adhesions already mentioned.

The operation of right salpingo-öophorectomy was performed and the abdomen closed.

The patient made an uneventful recovery, and during the 3 years which have elapsed since operation she has been perfectly well and has menstruated regularly. She has not as yet become pregnant, however, and this is causing her some anxiety, but her husband is serving overseas and is able to return only at infrequent intervals.

DESCRIPTION OF THE TUMOUR.

The specimen consists of a solid ovarian tumour with the Fallopian tube curving around its circumference. It is almost spherical in shape and measures 3 inches (7.5 cm.) in diameter. Examination of the cut surface shows the tumour to be encapsuled, somewhat lobulated and of a bright yellow colour (Fig. 1). Its consistence is firm and elastic, without visible degenerative changes.

As the macroscopic appearances were in conformity with the pre-operative diagnosis of granulosa cell tumour, it was confidently expected that on microscopic examination this diagnosis would be confirmed by finding the usual folliculoid, cylindroid or sarcomatoid arrangement of the granulosa cells composing the tumour. Actually, the

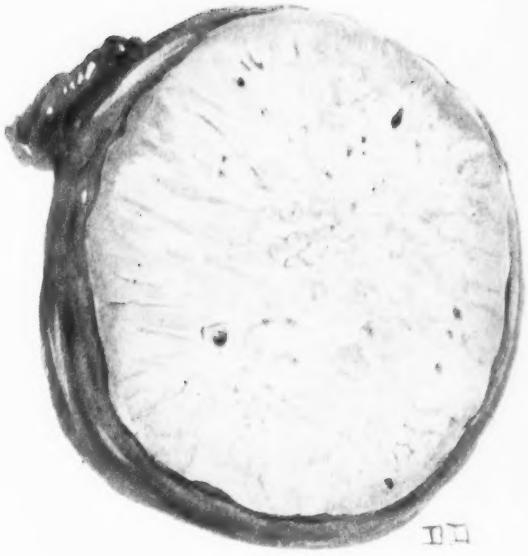

FIGURE 1.

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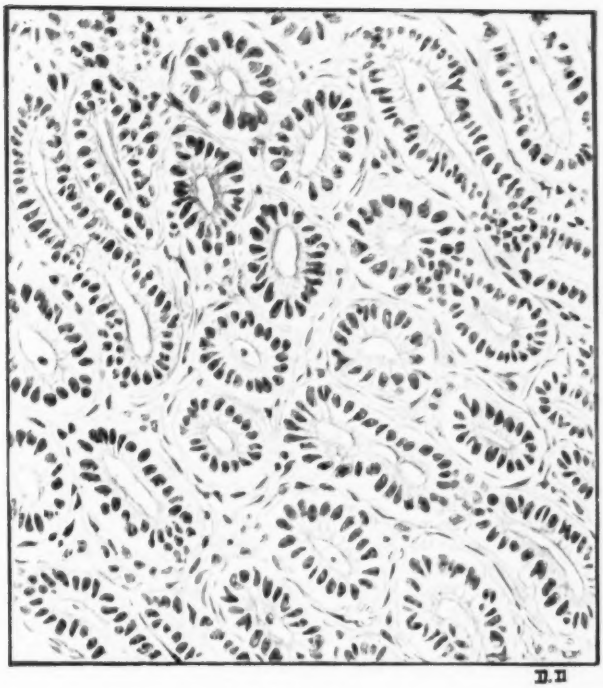

FIGURE 2.

Section stained with haematoxylin and oesin. × 200.

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FIGURE 3.
Section stained with Sudan IV. × 200.

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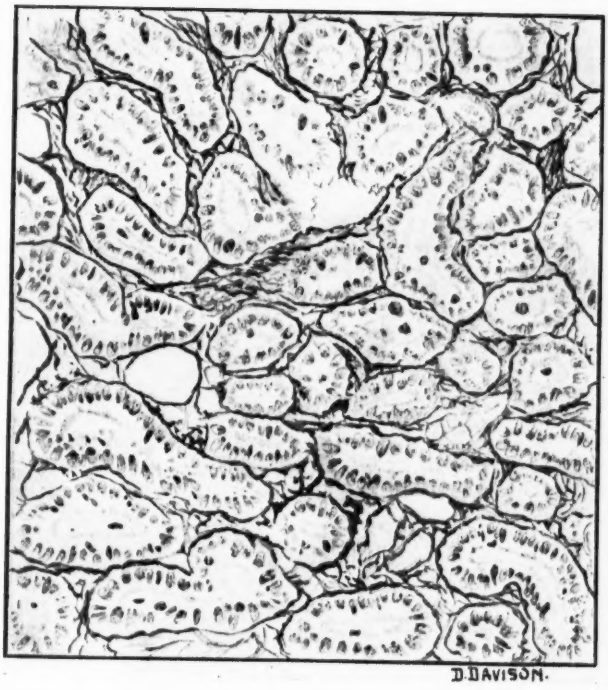

FIGURE 4.
Silver stain to show reticulum. × 200.

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histological picture was quite different, as under a low power the tumour was seen to consist of an encapsuled mass of perfectly-formed tubules more or less divided up into lobules by incomplete septa well supplied with blood-vessels. Lying over part of the circumference of the tumour and outside the capsule were the remains of the ovary proper containing Graäfian follicles in various stages of development, a number of corpora albicantia but no recent corpora lutea. The general arrangement of tumour and ovary suggested that the tumour had not originated in the ovarian cortex but in the medulla or hilum.

Haematoxylin and eosin, Sudan IV and a silver stain were used to demonstrate the microscopic anatomy.

In sections stained with haematoxylin and eosin (Fig. 2), the tubules were seen to be fully differentiated and to consist of a single layer of cylindrical cells with well marked inner boundaries and oval, deeply staining, peripherally placed nuclei.

Sudan IV revealed the presence of large amounts of lipid in the inner portions of the cells and in the lumina (Fig. 3).

A silver stain, employed to demonstrate the reticulum, showed that the latter surrounded the individual tubules with very little basket-weave arrangement between them (Fig. 4).

Discussion.

The tumour is an encapsulated, luteinized and hormonally active adenoma of the ovary.

The nature of its hormonal activity as deduced from the clinical history before and after operation—unfortunately neither a uterine curettage nor any hormone assays were carried out as part of the preliminary investigation—appears to be oestrogenic.

The tumour is highly differentiated but along unusual lines, the tubular arrangement being not unlike that present in Pick's testicular adenoma of the ovary which, however, is a virilizing tumour.

Traut and Butterworth[1] describe and illustrate a tubular type of granulosa cell tumour and state that it is extremely rare.

Similar types have been described by Varangot[2] and Henderson.[3] In Henderson's case there was vaginal bleeding and precocious development of sex characters in a girl aged 7 years.

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CRITICAL REVIEW

Chemotherapy in Obstetrics and Gynaecology

BY

MEAVE KENNY, F.R.C.O.G.

(*From the British Postgraduate Medical School*).

TEN years ago, sterilization of the blood by chemical means had come to be looked upon more and more as an unattainable ideal. Famous and futile procedures had been undertaken with this object but it had not been proven that any germicide was capable of killing bacteria in blood in a concentration attainable clinically. Then, at one step the ideal of *therapia sterilisans magna* advanced from the domain of medical mythology and became a concrete fact of daily practice. In 1935 was introduced to the world the first of the chemotherapeutic agents which, the world agrees now, constitutes the greatest therapeutic discovery in modern medicine—Prontosil. The story of its development is interesting. In 1908, Gelmo[1] synthesized para-aminobenzene sulphonamide. In 1909, Hörlein, Dressel and Kothe[2] prepared azo dyes with sulphonamide which "were distinguished by greater fastness for washing than those of sulphonamide-free products," a quality they attributed to the intimate union of the protein cells of the wool and the dye. The precise date of the synthesis of the basic form of Prontosil (2:4 diamino-azobenzene-4′-sulphonamide) is not clearly known, but in 1932 Mietzch and Klarer[3] applied for a patent covering the original Prontosil (hydrochloride of 4′-sulphamido-2, 4 diamino-azobenzene) and several other sulphonamide-containing azo dyes.

Early in 1935, Domagk[4] announced that "haemolytic streptococci of human origin were injected into 26 mice . . . later, half of them received . . . a single dose of a dark red dye (Prontosil) which had been synthesized by Mietzch and Klarer (Hörlein[5]) and all survived . . . Of the remaining animals which served as untreated controls . . . the last was dead on the 4th day."[6]

In France, Levaditi and Vaisman[7] confirmed Domagk's experimental results with mice, using a similar compound synthesized by Girard, as they had been unable to obtain supplies of Prontosil from the Germans who had protected its manufacture by patent. Later that year, the Tréfouels, Nitti and Bovet[8, 8a] suggested that the effective azo-dyes were broken down at the azo linkage in the tissues of the treated host, and that the curative agent was para-amino-benzene sulphonamide, now known as sulphanilamide. In addition to the reports of animal experiments, there appeared about a dozen case reports in Germany[9, 10, 11, 12, 13] on the use of the drug in human infections—both streptococcal and staphylococcal—unanimously favourable, but of little value as evidence since in most cases the recovery of the patients was entirely ascribed to the treatment; too little allowance was made for the tendency to spontaneous cure of these infections. The cases were not assorted with sufficient care either clinically or bacteriologically, but the reports did serve to arouse the greatest interest in England, and laboratory experiments and clinical trials were carried out by Colebrook and Kenny on patients suffering from haemolytic

streptococcal puerperal sepsis at Queen Charlotte's Maternity Hospital. In June 1936, Colebrook and Kenny[6] described the results of these trials which "one can say without fear of contradiction or thought of disparagement of the observations made by the continental investigators" were to arouse the interest of the world upon the subject of bacterial chemotherapy[14]; 38 women with severe haemolytic streptococcal puerperal infections had been submitted to treatment and cautious conclusions, instructed by the fine judgment and long experience of the staff of the hospital, were drawn as to the curative effect of the new drug. "Subject to confirmation by further experience," they said, "the impression has been gained that in many of the more severe cases the drug has exerted a definitely beneficial effect . . . 3 patients in whom there was generalized peritonitis on admission (1 with a positive blood culture) have recovered." Confirmation was quick to come. In December 1936, the same workers[15] reported their results with 64 women treated thus. Three only had died, a mortality-rate of 4.7 per cent. The death-rate for similar cases in the previous 5 years was 22 per cent.

The death-rate for cases with positive blood cultures (haemolytic streptococci) dropped from over 60 per cent to 25 per cent. None of the treated patients developed pelvic or metastatic abscesses. The average stay in hospital for the 61 Prontosil-treated patients who recovered was 18 days, while that of the 61 consecutive non-fatal cases immediately before the introduction of Prontosil was 31 days. A year later Colebrook and Purdie[16] confirmed that one of the notable effects of sulphonamide therapy is the way in which it prevents a spread of the infective process from the placental site. In their series of 106 patients parametrial or extra-uterine spread occurred in only 5 per cent and in these the spread was only of small extent. These authors also showed that, nevertheless, sulphonamides do not lead to a rapid destruction of the haemolytic streptococci, for the organisms can be recovered from the birth canal of treated patients weeks after clinical recovery has taken place, and that, therefore, operative procedures must still be avoided as far as possible or postponed until an effective blood concentration of sulphonamide has been reached, when the chance of an extension of the infection resulting from operative trauma will be greatly reduced.

The use of the drug Prontosil and its modern successors is now widespread, but it is interesting to note that Colebrook and Kenny's first results have never been bettered, and appear to represent the maximum that can be reached until the ideals of quick clinical and bacteriological diagnosis and early and adequate treatment can be made universal. It is also of interest that the dosage devised by these first workers on mainly clinical experience has become the standard for nearly all the sulphonamide derivatives and has been shown to give the necessary bactericidal concentration of the curative agent in the blood in most cases. Hard experience has shown that the more massive doses of the newer sulphonamides sometimes advised are unnecessary, distressing, and occasionally dangerous in their toxic effects.[17] The intent is to reach a blood-concentration of the drug of 10 to 15 mg. per cent as quickly as possible[17] and to maintain these levels until the patient has been afebrile for a few days. The 4-hourly dosage scheme is important since only thus can even concentrations be maintained in the blood.[18] Occasionally, patients are encountered in whom the prescribed dose of sulphonamide does not give the desired concentration in the blood. In such individuals, clinically recognizable by their

unfavourable progress, the dose must be increased until the proper values are obtained. In the experience of many[17] in all branches of medicine, unfavourable results with the drug have been more often attributable to this failure to achieve correct concentrations of the drug than to the rare presence of insensitive or resistant strains of streptococci. In these latter cases penicillin should be the immediate resort. It is very often customary, in these days, to give a large initial dose of the chosen sulphonamide in order quickly to establish effective levels of drug in the blood of patients stricken with severe infections—this dose being usually of 4 g.[19] The reviewer hesitates to recommend this large dose in obstetric or gynaecological practice and prefers to build up the effective level over the first 24 hours, as was found possible by Colebrook and Kenny. In any method of administration adopted, an average of 1 g. of the drug per 10 kg. of body-weight per 24 hours is the standard dosage,[20] with, in women, a maximum daily dose of 6 g. during the febrile period and for 2 to 3 days after. Then the dose may be halved for 3 to 4 days and halved again for 3 to 4 days, making an average of 40 to 45 g. in all, in severe infections. Below is reproduced, for historical and topical interest, the original scheme of administration devised by Colebrook and Kenny.[15] Each 20 c.cm. of the Prontosil given intramuscularly represents 0.5 g. With the modern sulphonamides parenteral therapy is necessary only when oral therapy is impossible. The blood of the patient, whose clinical record is here shown from the books of Queen Charlotte's Maternity Hospital, gave a growth of more than 5,000 colonies of haemolytic streptococci per c.cm. on culture in the first 2 days, and of more than 3,000 colonies on the 3rd day. It may be seen, therefore, that the drug and the scheme of dosage were submitted to a very severe trial, and in view of the fact that such a large number of haemolytic streptococci are usually observed only in the terminal stages of a fatal infection, the patient's prompt recovery was astonishing but must have been imitated many thousands of times since 1936.[14] The picture will, however, explain the reviewer's personal predilection for the original Red Prontosil in cases of desperate illness.[20]

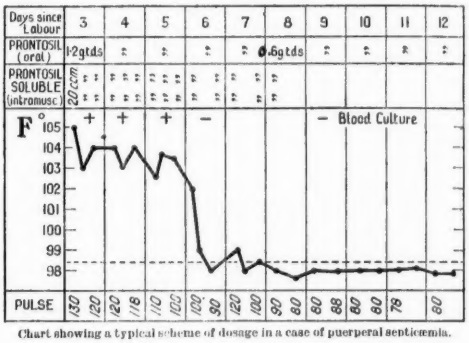

Chart showing a typical scheme of dosage in a case of puerperal septicæmia.

Despite the famous drop in the mortality from puerperal sepsis[21, 22] the picture does not call for complacency. Colebrook,[23] in 1935, in the course of a plea for the use of effective antisepsis in midwifery, calculated that 6,000 to 7,000 women became infected with haemolytic streptococci in childbed each year in England and Wales, and some 1,200 to 1,500 of these died. We know, from the falling death-rate, that the vast majority of these now recover under treatment with sulphonamides, but the incidence of this fearful disease shows no such happy decline but indeed a rise![21, 22] In 1934 there were 597,642 live births in England, with 8,431 cases of puerperal fever (14.1 per thousand) and 1,212 deaths (14.4 per cent). In 1939, 619,352 babies were born, 9,252 mothers were infected (14.9 per thousand), although only 476 died (5.2 per cent). These are the last figures we can analyse; they cover years of peace, before such considerations as increase in primi-

gravidity, scattering of population and deterioration of medical services could be advanced to mitigate the sad facts. The same has occurred between the years 1936 and 1940 in the United States of America. In some centres, notably, from the reviewer's personal knowledge, at Queen Charlotte's Maternity Hospital and the Obstetric Unit of the British Postgraduate Medical School,[24] years may pass without the occurrence of a single case of haemolytic streptococcal infection in the puerperium—the sincere application of preventive measures having brought about the virtual eradication of sepsis. But the increasing figures of incidence of the disease for the whole country forces the belief that the introduction of the sulphonamides may not have been an unmixed blessing for childing women—that against the improvement of obstetric technique in some centres may be set a new recklessness in others, engendered, paradoxically, by confidence in the power of the sulphonamides to cover errors of judgment. The boast of the obstetrician should not be that since 1935 he has not had a single maternal *death* from sepsis, but that, with a realization of the serious consequences of the disease, he has reduced or banished the *incidence* on his service.

In 1937, Kenny[25] drew attention to one of the most evil of the remote effects of puerperal sepsis. In a group of 100 young women who had recovered spontaneously from the disease, during 4 to 5 years of the subsequent active childbearing period of life, there had been achieved only 5 pregnancies and only 4 live births. The average age of the patients at the time of this follow-up was 27 years—thus, it appeared that the ravages of the disease had definitely diminished the fertility of 95 young women aged 22 to 23. These distressful figures were confirmed almost exactly by Barr in 1939.[26]

Cure, therefore, however certain and dramatic with the new chemotherapeutic agents, is not enough. Colebrook and Kenny[6] were the first to advance the possibility that the prophylactic use of sulphonamides might control the development of puerperal infection in women who, either from the nature of the delivery or its environment, had undergone the risk of streptococcal contamination. Kenny[27] warned that small doses were ineffective for prophylaxis, and the earliest large-scale clinical experiment carried out by Johnstone[28] giving only 2 to 3 g. daily for the first week of the puerperium to all women delivered on his service in 1938, showed that these doses had no power to diminish the incidence of streptococcal infections, the results being in no way better than those of the control period, the previous year. It seems, therefore, in the present state of our knowledge, that prophylaxis can be achieved only by the attaining of "curative" levels of the drug in the blood by "curative" dosage. Recently, that this may be so has been demonstrated by Geisendorf and others[29] who gave full curative doses (large initial dose and maintenance doses for 1 week—31 g. in all) to all women delivered on a large service in Switzerland, for they found that postpartum urinary infections were reduced to one third of the incidence found in untreated controls, and that pelvic sepsis as manifested by thrombophlebitis also occurred one-third as frequently. Le Lorier,[30] quoted by Geisendorf and by Domagk,[31] gave sulphanilamide prophylactically to 3,390 parturient women in 1 year, and not only achieved a decrease in the incidence of uterine sepsis, but also observed only 18 cases of urinary infection as compared with 76 such among the same number of untreated controls. The reviewer shares Colebrook's[23a] opinion that the drug should be administered prophylactically in certain

cases in which delivery has been difficult, or when exposure to streptococcal infection at or near the time of delivery has been known or suspected to have occurred. Also, that bacteriological investigation of the birth canal must be carried out as soon as possible thereafter, especially in cases in which gross traumatism has been incurred, as the infecting organisms are then frequently the anaerobic streptococci against which the sulphonamides have not as yet been shown to prevail, and where the toxicity of the drugs may weight the balance against an already poor chance of recovery. The administration of the drugs to all women in labour is open to strong objection. "The flair of the accoucheur is reduced to the *rôle* of a distributor of pills."[30] The proportion of intolerants to the sulphonamides is not large, but if the number of cases treated increases, the problem of intolerance will become important; the price of the medicament is not negligible if employed in full doses in thousands of cases a year; the number of cases of sulphonamide-resistance would also increase.

Local Implantation of Sulphonamides.

Colebrook and Kenny in 1936[6] showed that in mice a large subcutaneous implant of Prontosil in suspension formed a depot from which absorption of the drug and protection from experimental infection might continue for some weeks. Purdie and Fry[32] in 1937 reported a case of chronic infection of the skin and subcutaneous tissues which had refused to heal for 3 years following puerperal sepsis, but healed completely within 6 weeks under local treatment with sulphanilamide powder. They pointed the way to the now widely used measure of using intraperitoneal deposits of the drug for both local and systemic antiseptic effect in the presence of known or suspected infection. Enormous concentration of the drug (200 to 1,000 mg. per 100 c.cm.) can be obtained at the site of implantation and maintained for many critical hours before gradually subsiding.[17] The most valuable application of this manoeuvre in the obstetric field has been the habit of scattering 10 to 15 g. of the more soluble sulphonamides (sulphathiazole or sulphadiazine) over the uterine incision in Caesarean section in infected cases. In the reviewer's opinion, supported by those of many others[17] this may enable the obstetrician not only to perform abdominal delivery with confidence in doubtful cases, but also to avoid the mutilation of the Porro operation, and to conserve the uterus even in infected cases. A seemly method is to place the drug in a finely powdered and *sterilized*[33] condition under the peritoneal flap of the bladder, which is then drawn up over the wound in the lower uterine segment and sutured at a higher level to complete the operation. Systemic therapy should not be begun for 2 days after implantation, and thus a possibly nauseated patient may be spared the oral intake of the drug. The intraperitoneal deposition of the drugs is also valuable in gynaecological operations in the presence of peritonitis[17] or in cases in which soiling of the peritoneum cannot be avoided, and is useful also when the abdomen has been inadvertently opened in acute salpingitis.

Intrauterine deposition of sulphonamides has not been used to any known extent in this country although such tamponage has been suggested in both Latin and North America.[34, 35] It is probable that absorption of the drug through the large uterine sinuses would be abrupt, and, in the case of the less soluble sulphonamides, possibly dangerous.

Urinary Tract Infections.

The last 10 years have seen as great a change in the diagnosis, management and treatment of infections of the urinary tract

as of puerperal sepsis. Fuller's[36] discovery in 1933 that beta-oxybutyric acid produced by the ketogenic diet was a urinary antiseptic gave excellent results in ideal conditions, but the diet is so difficult to adhere to in the acidosed, nauseated, pregnant woman as to be impracticable. In 1935, Rosenheim[37] introduced mandelic acid which, while simple to administer and very effective, is open to the same objection as it has a definite therapeutic effect only when the *p*H of the urine is 5.0 or lower, a figure usually impossible to attain in pregnancy or early puerperium. In 1937, Kenny, Johnston, von Haebler and Miles[27] showed that sulphanilamide in small doses produces a rapid decline in clinical symptoms and bacterial infestation of the urinary tract in pyelitis of pregnancy and infections of the urinary tract encountered in obstetrics and gynaecology generally. Cuthbert,[38] in 1938, reported good results with sulphonamides in urinary tract infections in the puerperium, whether or not these were complicated by genital sepsis. All these and other workers[19, 39] had the best results when the infection was due to Bact. coli, in mixed infections the results were not so good. Penicillin combined with sulphonamide may well provide the remedy in these cases.[91] It is important to judge each case considered suitable for chemotherapy not only by purely clinical evidence, but on microscopic examination of the urine and the bacteriology of the urinary tract. Jäämeri[40] found that the urine of 600 pregnant or parturient women contained organisms of the colon-aerogenes group in 16.3 per cent of cases, and four-fifths of them had no clinical signs of the disease. Dodds[41] showed that the Bact. coli can be demonstrated in the urine of 7.5 per cent of pregnant women, but that less than 1 per cent develop pyelitis. Douglas[19] found a significant infestation of the urinary tract with Bact. coli in 15 per cent of cases of puerperal fever. The predisposing hormonal factors associated with pregnancy, labour and the puerperium are obviously directly responsible for the development of conditions of the urinary tract of increased vascularity, dilatation, atony, hyperplasia and oedema, all combining to produce urinary stasis,[42] apparently the primary inducing factor in the introduction of sepsis but possibly the reason, too, for the therapeutic concentration of the drug obtainable with small doses. Trauma during labour is an important factor in puerperal urinary infections as injury to the bladder, a very susceptible organ, is usually followed by infection. Also, neglect to observe atony of the bladder during the early puerperium which necessitates repeated or continuous catherization constitutes another predisposing factor in the production of puerperal urinary tract infections and the sulphonamides should be administered prophylactically in such cases. In gynaecological practice, with rare exceptions, we do not have to deal with these hormonal influences, but the proximity of the genital and urinary systems frequently leads to complications spreading from the one to the other. Relaxations of the anterior vaginal wall often cause residual urine in the bladder which is followed by infection, and in gynaecological surgery trauma to the urinary tract is very often inflicted.

For all these infections specific treatment is now limited to the various sulphonamide drugs. Sulphanilamide is most widely used in this country because of its cheapness, availability and infrequent production of renal complications. Sulphapyridine should never be used in pregnancy because of its high toxicity. Sulphathiazole is effective against staphylococci as well as Bact. coli, but has the highest capacity for the production of crystalluria.[19] We therefore do not recommend its use when renal com-

petence is in question. Douglas[19] writes highly of sulphadiazine, but his recommended dosage of all the sulpha drugs is unnecessarily high as are those advised by Browne[43] quoting the Medical Research Council War Memorandum.[43a] Kenny and Johnston[27] and Cuthbert[38] showed that a satisfactory concentration of the drugs could be achieved in the urine of pregnant or puerperal women by the administration of 1.5 to 3 g. per day, and over and over again experienced observers[44, 45, 46, 47] have shown that 2 to 2.5 g. per 24 hours in adult patients is all that is needed. This dosage rarely needs to be exceeded except in fulminating pyaemia or pyonephrosis, the now very unusually seen developments of pyelitis. Usually, with these small doses, the causative organisms are eliminated within 4 days.[27] If a satisfactory therapeutic response is not obtained in a few days, further investigation of the urinary tract becomes necessary and pathological obstruction or anatomical abnormality will usually be found. One should never persist with therapy in the hope that prolongation of the period of treatment will accomplish cure. Failures or recurrences should be subjected to complete urological investigation.[19]

There is not usually the necessity to add alkalis to the sulphonamide course although Helmholtz[39] and others[43] consider this important. This is particularly true of sulphanilamide, which drug Kenny and Johnston[27] showed to have a tendency to alkalinize the urine. But Gilligan[49] says that sulphadiazine and sulphathiazole are respectively 20 and 13 times more soluble in a urinary *p*H of 7 to 7.5 than of 5.0, also that the latter drug has a tendency to acidify urine. Therefore, if either of these drugs is used, sodium bicarbonate in adequate doses should be exhibited as well. Fluid intake (3,000 c.cm.) and urinary output (1,500 c.cm.) should be carefully maintained and oliguria treated as a warning sign of crystalluria. It occurs usually with unnecessarily large or prolonged dosage.[50]

The prophylactic administration of the drugs for 3 to 4 days before and after gynaecological operations is recommended for the prevention and control of urinary tract infections. Good convalescence is promoted especially if retention of urine occurs and necessitates catheterization. Waugh, McCall and Herrell[48] have shown that sulphonamides deposited intraperitoneally at operation are excreted in effective amounts from the urinary tract for many days and thus reduce materially postoperative morbidity due to urinary infection.

Venereal Disease.

The treatment of gonorrhoea by the sulphonamides has marked a milestone in the history of venereal disease. The reported results of the treatment in women are even more brilliant than those reported of males.[51, 52, 53, 54, 55] There has been much discussion and dissension of opinion on when the treatment should be begun for optimal results, and whether the patients should be hospitalized during treatment. The original rate of cure, 93.4 per cent, obtained in 1938 by Mahoney,[54] in a group of 61 women ill with chronic infections and hospitalized, has not been surpassed. Therefore, it has seemed good to many workers to delay treatment in the female patient as in the male, until a partial degree of immunity to the gonococcus has been developed. But the remote effects of the untreated spread of the disease in females can be so serious, or even dangerous (if subsequent pelvic surgery becomes necessary), that informed opinion now urges the treatment of the infection as soon as it is recognized in the early stages. This opinion has been fortified by the observations of

McElligott[54] and others[54, 55, 56] that the treatment with sulphonamides of gonorrhoea in women almost entirely abolishes the spread of the disease, especially when combined with hospitalization so that conditions of treatment and rest can be controlled;[17] and if extension to the adnexa does occur, rapid resolution can be expected with this therapy. Grodberg and Carey[57] show that even when acute masses significant of salpingitis develop, these resolve with treatment in 10 to 14 days. This has been confirmed by others.[56] As to dosage, the reviewer considers that the moderate amount of the drugs advised by Long,[14] i.e. 4 to 5 g. daily for 3 days, followed by 2 to 3 g. daily for a week, is enough. Even smaller doses[57] have given as good results and larger doses no better.[58] A convenient and memorable scheme is that devised by Durel[59] with sulphapyridine in the treatment of male gonorrhoea, 3 g. daily for 3 days, 2 g. daily for 3 days, and 1 g. daily for 3 days. The single massive dose of sulphonamides suggested by Pappas[60] in the treatment of the disease in males has also been tried in females by Strauss[61] who finds that a single day's therapy with 8 g. of sulphathiazole or sulphadiazine cured 90 per cent of his chronically infected cases. Cohn and Grunstein[58] compared 2 schedules of chemotherapy in women with gonorrhoea, some 80 per cent of whom had adnexal involvement. In one group, 12 g. of sulphathiazole was given over 3 days and in the other, 21 g. over 7 days, with almost identical therapeutic effect. A blood level of 5 to 7 mg. per cent during the period of treatment seems to be sufficient.[14, 19] We are not dealing with a deadly but with a mutilating infective process in gonococcal disease. Our aim is to limit its local virulence and prevent its spread. The relatively heroic doses required in septicaemia and other generalized infections are directed to life-saving. Local treatment is not usually necessary in females when sulphonamides are used, and this makes the treatment most valuable in pregnancy. However, heat therapy by Elliott's apparatus or diathermy is useful in chronic disease.[56] It is a wise practice to give a course of a sulphonamide shortly before and after an infected pregnant woman is delivered, even if there has been apparent cure previously, both to protect the mother from the now rarely seen puerperal spread of the disease and to lower the virulence of possibly still-existent organisms in the birth canal in the interests of the baby. There is yet much information that must be gathered on the incidence of permanently damaged Fallopian tubes in treated cases of salpingitis. A recent paper by Barrows,[56] confirmed by Hunt and others,[17] claims that in treated cases of gonococcal salpingitis the pelvic masses disappear in 80 per cent as compared with a resolution-rate of 20 per cent in untreated controls. Even severe cases have a 60 per cent chance of success, but late cases have poor results. There is however no note on the patency of the tubes thereafter. All[17, 56] advise that even old-standing cases should have treatment with sulphonamides as some tubal salvage may result, the period of illness is shortened and eventual surgical treatment made safer and easier.

Pronouncement of cure in the infected female has not been made easier by the new chemotherapy, for so greatly has the sulphonamide group of drugs changed the state of affairs that it has become very important to classify separately tests for cure in those who have and those who have not had sulphonamides. Jones[62] maintains that the sulphonamides "change the characteristics of the gonococcal slide," the changes consisting in marked alterations in the morphology and staining reactions of the gonococcus. Great care must be exercised therefore to prevent the asymp-

tomatic carrier being loosed upon the public. Pelouze[63] insists that re-examination should be made on several occasions after apparent cure, preferably after or during a menstrual period and after resumption of sexual life (in which the partner should be protected by a condom) for some months. He also claims that it is possible for a treated patient to transmit asymptomatic disease, the victims being unaware that they are infected until they transmit the disease to another. The incidence of sulphonamide-resistant cases is probably low in properly treated cases and it is likely that some of them are due to reinfection. Penicillin, when available, seems to be of use here.[71]

Vulvovaginitis in Infants and Children.

After several early favourable reports upon the use of sulphonamides in this condition (Brown,[64] Hoffmann,[65] Gaté and coworkers[66]), there have recently been publications showing that their scope is limited and the results disappointing. Brown emphatically declared her results to be brilliant, yet Hoffmann claimed but 16 cures among 25 young girls and found that only 2 of the remaining 9 were cured by further courses of the drug. Gaté and Cuilleret claimed 100 per cent cure in 8 affected infants. Alyea[67] reported only a 20 per cent permanent cure-rate and Grodberg,[57] Compton[14] and Long[14] were also discouraging. Sandes[68] has found that little girls between the ages of 2 and 10 years develop toxic symptoms readily and do not tolerate the drug well. Her paper and those of the others all deal with the use of the earlier sulphonamides and it may be that the later preparations will be at least better tolerated by small children. The results in general remain far inferior to those obtained by the administration of the oestrogens.[69] In a small number of cases of vulvovaginitis in young children in whom the infecting organism is the *streptococcus haemolyticus* and *staphylococcus aureus* the reviewer has obtained rapid and permanent cure with a combination of oestrogen and sulphanilamide.

A recent paper by Cohn, Steer and Adler[70] has claimed a very high rate of cure with sulphapyridine in anorectal gonococcal infection in young children.

With the increasing availability of penicillin for civilian use and its already known value in the treatment of sulphonamide-resistant cases of adult gonorrhoea,[71] it may be hoped that a treatment will be evolved for these sad infants wherein local therapy and examinations may be kept to the minimum consistent with the required knowledge of the progress of a case.

Ophthalmia Neonatorum.

The annual returns from the Ministry of Health[72] show that for the 7 years, 1934 to 1940, 44 children in England and Wales were blinded from ophthalmia neonatorum; during 1941 and 1942, only 1 case was reported. The incidence of impaired vision from this disease likewise has declined, the figures for the two periods being 190 and 14 respectively. In 1931, blindness from ophthalmia constituted 21 per cent of all cases of blindness in children admitted to schools for the blind managed by the London County Council, in 1943, the proportion was 9.8 per cent.[72] In the United States of America, in 1941, the proportion was 5.6 per cent compared with 28 per cent earlier.[73] Authors in both countries[72, 73] stress that while silver nitrate is still the best preventive measure, it has very definite limitations, and the improvement in the figures they quote is largely due to the sulphonamides "in which we have a therapeutic agent that makes blindness or impaired vision from this affection no longer tolerable."[72] Treatment should be both prenatal—diagnosis and treatment

of infections in the prospective mother, and postnatal use of a prophylactic agent in the eyes of the newborn infant and vigorous use of the sulphonamides in declared disease. The drug of choice is now sulphathiazole in doses of 1 gr. per pound of body-weight, given orally.[73] Cases resistant to sulphonamides should receive penicillin therapy[72a, 74, 75] and there still seems to be a place for artificial fever therapy should chemotherapy fail.

Choice of Drug, Toxicity, etc.

At the present time we have available for general use in this country, adequate supplies of sulphanilamide, sulphapyridine, sulphadiazine, sulphamezathine and sulphathiazole, and limited amounts of others such as sulphamerazine and sulphacetamide.

The drug of choice is that with the greatest specific bactericidal effect and least toxicity. All the sulphonamides are toxic, the poisonous effects are commonly believed to be due to sensitivity or idiosyncrasy—neither the quantity of the sulphonamide used nor its level in the blood seems to be definitive in producing fatal lesions although in general large and especially prolonged doses are dangerous.[76, 77] The dangerous complications of sulphonamide therapy are those affecting the haemopoietic system and causing agranulocytosis and haemolytic anaemia; and the urinary tract by mechanical damage leading to anuria and uraemia. This last is effected by the deposition of calculi composed of crystals of the drugs in the renal tubules or pelvis.[78] Fatal doses have ranged from 96 g. to 0.6 g. in the production of agranulocytosis and renal injury respectively.[76] Agranulocytosis usually appears after 2 weeks of treatment. The minor complications such as met- and sulph-haemoglobinaemia producing the now well-known lividity of the skin described by the early workers[6] are never serious; development of drug fever or rashes is usually an indication of a degree of intolerance, but there is no definite evidence to suggest that these reactions are precursors of the more serious ones.[79] Drug fever and drug rash usually appear after 9 to 12 days of treatment, and are considered to be a sensitivity reaction and may be related to previous administration of the drug.[80] Drug fever may be high with rigors and should be suspected when improvement produced by sulphonamide is followed by recurrence of temperature while sulphonamide is still being given.[77]

Recent reviews of deaths from the sulphonamides[79] show that all the popular preparations are incriminated, sulphanilamide being still apparently the least dangerous next to sulphadiazine, but comparing poorly with the latter drug in its range of bactericidal action. Sulphathiazole, while effective in a wide field of diseases and well tolerated by pregnant women, has the highest incidence of renal complications and can cause agranulocytosis. It is also prone to produce drug-sensitivity and should not be used again if subsequent therapy is needed. Sulphapyridine is widely effective but most toxic for all systems, and should not be used in pregnancy or the puerperium. Sulphadiazine is both effective and of low toxicity; it has not as yet appeared in the literature of agranulocytosis but has caused fatal uraemia. It appears to be effective in quite low concentrations in the blood (3.5 to 5 mg. per 100 c.cm.[19]) so that a dosage of 4 to 5 g. per 24 hours may be used with success. Sulphamerazine is as bactericidal as sulphadiazine, more soluble and more rapidly absorbed, so that even smaller doses give a constant therapeutic level in the blood. Its toxicity is about the same.

Sulphamezathine, a recent British production, is less toxic than sulphapyridine,[79a]

is rapidly absorbed and being freely soluble the risks of urinary complications are minimal.[79b] Agranulocytosis or the disturbance of erythropoiesis has not been observed even in cases where the blood-concentration of sulphamezathine has reached 30 mg. per cent.[79a] Its use is therefore recommended in pregnancy or in cases where renal efficiency is doubtful. It appears, however, from the latest available evidence that sulphamezathine gives only variable clinical results in gonorrhoea.[79c]

The toxic effects of all these drugs on the haemopoietic system may be controlled by a watch on the blood picture if there is a necessity for a long course of treatment, appropriate measures of stimulation and replacement being taken if signs of damage appear, and the drug discontinued. It is important to remember that the clinical manifestations of blood dyscrasias from these drugs are faint in the early tractable stages; when they are marked, it is usually too late for effective remedy, and that, therefore, repeated blood-counts must be carried out after the first week or 10 days of treatment and before a second course of the drugs. Mechanical damage to the renal tract by crystalluria can be prevented by avoiding initial massive doses of the drugs, especially of sulphapyridine and sulphathiazole, encouraging a daily fluid intake of at least 3 pints during therapy and watching for signs of oliguria. Personal opinion reinforced by that of others[50, 80] suggests that if there is a necessity to continue the administration of a sulphonamide despite the appearance of toxic complications or if a second or subsequent course becomes necessary in the treatment of a patient who has shown signs of intolerance in the initial course, another sulphonamide should be chosen; for example, if sulphapyridine be poorly tolerated, treatment may be continued or resumed with sulphamezathine or sulphadiazine or sulphacetamide, this last drug especially in recurrent pyelitis of pregnancy.[50] In any review of the respective toxicity of the sulphonamides, it must be recalled that the smaller incidence of toxic effects claimed for any of the newer drugs may be due not only to lower toxicity, but in part to the fact that these have not yet been as widely used as the older preparations, and full reports of their application are not yet to hand.

Penicillin.

The chemotherapy of bacterial infections passed, as we have noted, from an ideal to reality with the advent in 1935 of Prontosil. During the rapid development of sulphonamide treatment which followed, other organisms than haemolytic streptococci were found to be vulnerable and it seemed likely that with the discovery of new drugs of this type all bacterial infections could be vanquished. But it was soon found that the sulphonamides had their limitations; even among the susceptible bacteria some strains are exceptionally resistant to the sulphonamide drugs and many species are wholly resistant. The time was ripe for a great new chemotherapeutic discovery which would provide a remedy where sulphonamides fail, and this was made by Fleming, the discoverer of Penicillin. Penicillin was discovered in 1929[81, 82, 83] and used by its discoverer for differential culture, but, like Prontosil, its use for practical therapeutics was completed neglected until the Oxford workers started their investigation in 1938. It is now known to combine enormous antiseptic power with such a degree of freedom from toxicity in the human body that much more than a therapeutic concentration can be achieved in the blood without ill effect. Penicillin has fulfilled the hopes entertained with the sulphonamide drugs—deadliness to bacteria and harmlessness to the body to an

extent undreamed of by the most sanguine chemotherapist. All of our present knowledge of its clinical possibilities is based on the studies of Florey, his wife, and his colleagues.[84] Penicillin salts are used therapeutically, the sodium salt for systemic treatment and the more stable calcium salt for local application. Potency is expressed in Oxford units, an arbitrary amount devised by Florey by comparison with a standard preparation. The only penicillin-resistant organisms that interest the obstetrician and gynaecologist are the tubercle bacilli, and almost all the gram-negative bacilli including the typhoid-dysentery group, the *genus Brucella* and the frequent wound and urinary tract invaders, *Proteus* and *Ps. pyocyanea*.[85]

Penicillin can be used by local application in suitable cases or by parenteral injection. It cannot be given by the alimentary tract as too much of it is destroyed by acid in the stomach or by bacteria in rectal infusion. Unfortunately, in view of its cost and scarcity, it is very rapidly excreted in the urine, so that to keep up a therapeutic level it is necessary to use continuous intravenous or 3-hourly intramuscular injection day and night, the daily dose for an adult being 120,000 Oxford units, in serious disease continued for 7 days or longer. The sudden and dramatic improvement often noted with the sulphonamide drugs is rarely seen; sustained and arduous treatment is the price of success.[85]

In the present circumstances penicillin should be used systemically only in conditions intractable by the sulphonamides or when sulphonamide sensitivity, resistance or intolerance has been demonstrated clinically. Until recently, supplies of penicillin were not available in this country for general civilian use since the armed forces were justly receiving the bulk of the supply. Its use here is still restricted to cases of grave illness so that the few papers on its use in obstetrical or gynaecological disorders and venereal disease have appeared mainly in the North American Press.

Puerperal Sepsis.

Keefer[86] reported 8 cases of postabortal and puerperal sepsis treated with penicillin. Five of these were postabortal anaerobic streptococcal infections, 3 got better and 2 died. The 2 deaths occurred in women with septicaemia; the 3 recovered patients had negative blood cultures. The puerperal cases had localized uterine infections with haemolytic streptococci or staphylococci, and recovered. The effect of penicillin, therefore was not apparent in this series of cases. However, Mitchell and Kaumeister[87] gave 40,000 Oxford units of penicillin daily to a moribund patient with puerperal sepsis due to haemolytic streptococci, sulphonamide-resistant, blood culture positive, pelvic thrombophlebitis present. The woman recovered. The hopes of obstetricians have been raised by reports of the sensitivity of anaerobic streptococci to penicillin *in vitro*. I am indebted to Dr. Robert Cruickshank[88] of the L.C.C. Group Laboratory at Hampstead for the following account of his experience of penicillin and the sulphonamides in anaerobic streptococcal puerperal infections, and Mr. James Wyatt, Consultant to the puerperal fever unit at the North-western Fever Hospital, who confirms the clinical impressions in the letter: "We have tested half-a-dozen or more of the 'septicaemic' variety of anaerobic streptococci against penicillin and all have been highly sensitive *in vitro*. Unfortunately we had no luck with penicillin therapy—4 cases treated and 4 deaths—although in 1 at least the primary septic thrombophlebitis seemed to have cleared up at autopsy, in my experience a most unusual finding. We have treated 20 more

of the typical anaerobic streptococcal septicaemic cases with sulphonamides without any response, the fatality-rate was around 80 per cent. Of course, a number of these infections were 'mixed' with *B. necrophorus* or were pure necrophorus infections, and the 3 strains of this organism I have tested for penicillin have all been resistant. . . ." It is known[23a] that bruised, lacerated, ischaemic tissues favour the growth of anaerobes. So that, thus far in chemotherapy, we have found no escape from the knowledge that good midwifery, the avoidance of undue traumatism of the birth canal, is our only present means of preventing the dangerous development of this disease.

Venereal Disease.

A small number of reports on the treatment with penicillin of venereal disease in women have appeared in the American press and are uniformly encouraging Herrell and fellows[89] state that the drug is most useful in the treatment of sulphonamide-resistant cases of gonorrhoea; Cook[90] claims results far surpassing those obtained with the sulphonamides in the initial treatment of gonorrhoea in women. Greenblatt[71] suggests that the problems of the asymptomatic carrier and the possible development of penicillin-resistant strains of gonococci may be answered by using larger than apparently necessary doses of penicillin in treatment. He and his co-workers consider that, although cure may be obtained with as little as 60,000 Oxford units, doses such as 150,000 units should be used. Thompson[91] finds that, with this larger dosage, 98 per cent of cases are cured and that it is quite free from toxic effect. The possibility that a coexistent early syphiletic lesion may be masked by treatment aimed at gonorrhoea has been raised.[91a] It seems advisable to test the Wassermann reaction of all penicillin-treated cases some 3 months later.

Penicillin has also been used by Lentz and his fellows[92] in the treatment of 14 pregnant women with early syphilis and 9 infants with congenital syphilis. They used total doses of 1,200,000 to 2,400,000 Oxford units, given by intramuscular drip in 8 days, and found that this was well tolerated by pregnant women. They think that the higher dosage is desirable. Although the period of observation has not been long enough to be certain that either mothers or babies have been cured, they state that miscarriage, stillbirth, and neonatal death are averted, the infants are born apparently healthy, and the course of the disease profoundly and favourably affected. The infected infants responded well to doses of 18,000 units per pound of body-weight, but grossly affected babies must be treated with smaller doses under careful paediatric supervision. A more recent paper by Lentz's colleagues, Platen and others[93] concerning 69 infants with manifest early congenital syphilis treated with 16,000 to 32,000 units per pound of weight shows somewhat unsatisfactory results, and the authors suggest that larger doses still, such as 40,000 units per pound, may give the optimal effect. In general, however, the immediate response of early congenital syphilis to penicillin, and its lack of toxic effect, has been gratifying; cutaneous and mucous lesions heal very rapidly and dark-field positive lesions become negative in 24 hours after the start of the treatment. Rhinitis is more lingering, but X-ray evidence of osteitis disappears in about the same time as with the metal salts. I feel that when treatment is being instituted primarily in the interests of the unborn child—the maternal syphilitic state being secondary, as in early infection in late pregnancy—penicillin should be chosen for its rapid beneficial effect, however imper-

manent, and its freedom from ill-effect. In a single case in my care, treated with large doses of penicillin, a woman in late pregnancy with a syphilitic rash and severe vulval sepsis, after a week's treatment both the rash and the vulval lesions disappeared entirely. The Wassermann reaction remains positive but this is to be expected during some weeks to come. She is as yet undelivered.

Ophthalmia Neonatorum.

Penicillin is now also being used in the treatment of ophthalmia neonatorum. Sievers[74] reports that 8 patients were treated with intramuscular injections in total dosage varying from 60,000 to 330,000 units. Six of the 8 responded promptly with pronounced clinical improvement within 24 hours and complete recovery in 3 to 6 days. The specific organisms disappeared in smears and cultures in 9 to 24 hours after beginning the treatment. These results are equal to those obtained with sulphonamides and it may be that penicillin should be chosen for use in very ill or premature babies afflicted thus, because of its slight toxicity.

Sorsby,[72a] too, claims that the dramatic results obtained by the use of the sulphonamides are paralleled by those given by penicillin. He has published results in a total of 47 cases of ophthalmia neonatorum treated by the local application of penicillin in the form of drops. He obtained optimum results with a concentration of 2,500 Oxford units per c.cm. in cases where the disease was caused by a whole range of organisms, gonococci, staphylococci and even the virus of inclusion blenorrhoea. The drug is well tolerated by the infant's eye, irrigation is generally not necessary after 6 hours, clinical recovery sometimes takes place in a few hours.

In the Obstetric Unit of the British Postgraduate Medical School penicillin eye-drops in 1,000 Oxford units per cent concentration are now being used routinely as a prophylactic measure in the newborn in place of silver nitrate. One drop is instilled immediately after cleansing the eyes and 1 drop an hour later after the bath.

Breast Abscess.

Since this complication of the period of lactation is usually due to infection with staphylococci, penicillin should be used as soon as possible to avert the need for surgery, and in combination with surgery when it is unavoidable. Private communications from London hospitals report its present use with oestrogens in mastitis, with favourable results in preventing the development of breast abscess. Fraser[94] reports on the use of penicillin locally, combined with simple aspiration of breast abscesses or with surgical drainage. He thinks that healing is much more rapid than usual in the treated cases and the organisms quickly disappear. Suppression of lactation by stilboestrol was necessary in his cases to achieve the best results.

In the reviewer's small experience with staphylococcal infections affecting mother or child in the early days of the puerperium, there has occurred very rapid healing of localized lesions of the infants' scalps after injection under the surrounding skin of small doses of penicillin; and in a single case of staphylococcal osteomyelitis of the humerus in a 3-days-old baby, there was immediate favourable response with penicillin after extensive spread intractable to surgery and sulphadiazine.

Thus far, then, the wide bactericidal range and freedom from toxicity of penicillin make it the drug of choice in nearly all of the infections encountered in the field of obstetrics and gynaecology; and our

hope remains that newer chemotherapeutic discoveries will set still wider bounds to the victory over disease, or, better, that a general improvement in obstetric practice may soon reduce the number of cases requiring the use of penicillin, or the sulphonamides, or other curious measures.

" 'Tis not enough that through the cloud thou break,
To dry the rain on my storm-beaten face,
For no man well of such a salve can speak,
That heals the wound, and cures not the disgrace . . ."[95]

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BOOK REVIEWS

"Principles and Practice for Pupil Midwives, Teacher Midwives and Obstetric Dressers." By R. CHRISTIE BROWN, M.B., M.S., F.R.C.S., F.R.C.O.G., and BARTON GILBERT, B.Sc., M.D., F.R.C.S., M.R.C.O.G. Infants' Section by RICHARD H. DOBBS, M.D., M.R.C.P. 2nd edition, 831 pages. London: Edward Arnold & Co., 1945, 15s.

This book is intended primarily as a textbook for the pupil-midwife studying for the examinations of the Central Midwives Board. The majority of pupil-midwives are already state registered nurses. The nurse who desires to become a midwife has to undergo some mental readjustment. Her training as a nurse has conditioned her to carrying out the doctor's instructions. Prepared only for delegated responsibility, she finds herself confronted, for the first time, with possible full personal responsibility. In most cases, it is true, she will be able to call in a doctor if required. But she must know when it is advisable to do so. For the first time she must learn to examine a patient for herself, to make a diagnosis, to rely on her own judgment and, perhaps, to carry out treatment in a grave emergency when a doctor is not available. She has not the medical student's scientific background to her training and her powers of reasoning have not been as well developed.

In this book the authors have made an effort to overcome these difficulties. The first 124 pages are devoted to a discussion of scientific principles, general anatomy and physiology. Matter and its structure, diffusion and osmosis, the elements of chemistry, energy, chemical changes in the body and the structure of the animal cell are discussed simply and lucidly. Throughout this section and also that devoted to general anatomy and physiology (in fact this is so throughout the book) care is taken to ensure that the reader will understand the subject matter. All that is discussed in this early part has a practical application to the actual obstetric facts which are recorded later. Careful study of these opening chapters will lay a solid foundation on which the pupil can build understood facts—facts which will be remembered because they are understood.

The customary obstetric field is covered. A good balance is maintained between the more detailed description of normal childbirth, its physiology and management, and the complications with which the midwife may be faced while alone (e.g. postpartum haemorrhage, eclampsia, etc.) on the one hand and those fields which necessarily belong to the practitioner or obstetrician on the other, but about which the midwife must have some knowledge. There is also a satisfactory balance between dogmatic teaching and the reasonable discussion of conflicting views and theories on controversial matters. While it is difficult to single out particularly good chapters, antenatal care, normal labour, postpartum haemorrhage, the toxaemias, contracted pelvis and disproportion are, perhaps, worthy of special mention.

Exception can be taken to some of the authors' statements. We are told, with regard to toxaemia, that "in milder cases in which a faint trace of albumin alone is present, confinement to bed is not so necessary, the return of the patient to the doctor or clinic *once a week* (italics mine) will suffice. . . ." Plugging of the vagina by a midwife in abortion (p. 390) and central placenta praevia (p. 411) is likely to do more harm than good—even in exceptional circumstances. There is a tendency to over-emphasize the fact that it is inadvisable to hurry the birth of the after-coming head in breech delivery. The lack of prompt delivery at the right moment can be equally fatal with too rapid delivery. No mention is made of the Burns' technique. In Figs. 173 and 174a showing delivery of the after-coming head the attendant's hands are depicted in exactly the opposite *rôle* of that ascribed to them in the text. This makes the description difficult for a beginner to follow. It is unfortunate that the Lancefield

Group A haemolytic streptococci should be called Type A. The inexperienced reader may thereby become confused between the Lancefield Groups and the Griffiths Types.

Errors appear here and there. Recent work on the foetal circulation by "Berkeley and his colleagues" presumably refers to that of A. E. Barclay *et al.* Sir James Young Simpson is erroneously stated to have been Professor of Obstetrics in the University of Glasgow. Edinburgh has its Simpson Memorial Hospital as a tribute to its great professor. Happier wording might have been chosen to describe the positive signs of pregnancy (p. 311). The *ability* to hear the foetal heart beating or to feel foetal parts is surely not a positive sign of pregnancy.

There is an excellent section of 6 chapters devoted to the child.

This second edition of an already popular book can be recommended with confidence to the pupil midwife. In spite of being comprehensive it is of a good handy size—one likely to appeal to the average pupil who is apt to be frightened by too large a book. It may also be read with genuine profit by those whose lot it is to teach the pupil-midwife.

ANTHONY W. PURDIE.

"Endocrinology of Women." By E. C. HAMBLEN, B.S., M.D., F.A.C.S. Clinical Professor of Endocrinology and Associate Professor of Obstetrics and Gynaecology, Duke University School of Medicine, Durham, N. Carolina. 571 pages with 157 illustrations. Price 8 dollars. Springfield, Illinois: Charles C. Thomas. London: Bailliere, Tindall and Cox. 1945.

This is one of the most valuable and outstanding contributions to the literature of endocrine disorders in women.

It is not intended as a second edition to Professor Hamblen's book "Endocrine Gynaecology," written 5 years ago, but represents an up-to-date summary and critical survey of clinical *data* and experimental work. The arrangement of the various subjects in 5 subdivisions affords easy reading and makes it a practical reference book. Two kinds of references are used, footnotes for documentation and a list of references at the end of each chapter for supplementary reading.

It is pleasing to see a book which does not contain a variety of unspecific and confusing terms for menstrual disorders and which does not list absence of or abnormal uterine bleeding as disease.

Symptomatic therapy is strongly opposed and the outlined treatment is accordingly aimed not at the correction of the menstrual disorder but at the underlying cause.

Many readers accustomed to the present-day nomenclature of menstrual disorders and their treatment as disease entities according to fixed schedule will at first move on unsure ground. However, the excellent presentation of the material and logical approach to endocrinology facilitates the understanding of the subjects described.

In the treatment of functional disorders Hamblen adheres, on the whole closely, to the physiology of the endocrine glands. Androgenic treatment in women is strictly opposed on the grounds of its unphysiologic nature.

The same view is outlined for the use of oestrogens in the climacteric; whenever its administration becomes necessary for symptomatic relief, the author advocates only small doses over 20 days and a 10-day rest period.

It is surprising to see that despite his fundamentally sound and critical approach to endocrinology, Professor Hamblen recommends fixed treatment schedules for hypo-oestrogenism and abnormal uterine bleeding.

In the treatment of hypo-oestrogenism Professor Hamblen ascribes to oestrogen withdrawal bleeding only nuisance value and advocates doses not high enough to cause bleeding. No value is placed on the psychological effect of regular "menses."

Part I is a short but detailed discussion of all endocrine glands, including the testes. The description of each gland is preceded by a history of discoveries concerning it. The secretory control, functions and interrelation of the glands, the chemistry and action of hormones are very well described.

The 2nd section deals with the applied endocrine physiology of the foetus, the infant, the child, and adolescent, and of conception; of the menstrual, anovulatory, gestational cycle and of the climacteric.

The 3rd part is devoted to endocrine diagnostic methods and gives a survey of the main procedures, including endometrial biopsies, vaginal smears,

chemistry of the blood and urine, and denotes the particular value of each.

Functional disorders of the various endocrine glands, their treatment and *rôle* in gynaecology are discussed in the 4th section.

The last part deals with endocrinology applied to gynaecological diseases. There is detailed discussion of abnormal uterine bleeding, complications of pregnancy and the climacteric.

The diagnosis and treatment of both husband and wife in sterility are well described.

There are numerous very good illustrations and diagrams attractively arranged throughout the book.

REVIEW OF HOSPITAL REPORT

THE ROTUNDA HOSPITAL, DUBLIN.

Founded 1745.

Incorporated by Royal Charter 1756.

BICENTENARY CONGRESS, JULY 1947.

THE recent victory in Europe encourages the hope that the Congress of Obstetrics and Gynaecology that is to be held in Dublin in the second week of July 1947, in connexion with the Bicentenary of the Rotunda Hospital, may be of a representative and international character. Already various speakers from Great Britain, America and Europe are being invited to open discussions on various subjects and a certain amount of preliminary work is at present being done.

The subjects chosen for discussion include: Eclampsia, Shock in Obstetrics, Foetal Mortality, Puerperal Sepsis, the Modern Approach to the Problem of Sterility, and an Historical Review of the progress in Midwifery during the past 200 years.

These various subjects should promote a series of interesting discussions, and, from the scientific as well as from the social standpoint, there can be little doubt but that the Rotunda Congress will be a most valuable and enjoyable addition to the resumption of international medical relations.

Obituary

Carlton Oldfield

(1871—1945)

CARLTON OLDFIELD came into gynaecology at a time when the horizon of that subject was being enlarged. No longer was the physician-accoucheur, as he was often called, to be restricted to attendance at childbirth and the repair of damage caused at that time; the abdominal surgery of the uterus and appendages was coming into his purview and Oldfield made himself a master of this in a city where new surgical ground was being broken almost every day.

The Goodenough Report on medical education has recently stressed the value of experience in general practice to the specialist in training. Carlton Oldfield had the advantage of a long period in general practice before he specialized.

In the early years of this century the ambitious gynaecologist often took the higher qualification not only in surgery but also in medicine. Oldfield became first a member of the Royal College of Physicians, and later, 16 years after he qualified, a fellow of the Royal College of Surgeons. The work for these examinations was all done in time he managed to find while fully employed in a very busy general practice. I remember one of his friends telling me many years ago how he would work late into the night in front of the fire with a book on the mantelpiece, standing to keep himself awake.

His early training after qualification was done under one of the greatest of Leeds surgeons, Mayo Robson. He was appointed surgeon to what is now the Hospital for Women, and on Dr. Hellier's retirement he succeeded him as gynaecological surgeon to the Infirmary at the end of the first world war. Later he succeeded Dr. Croft as Professor of Obstetrics and Gynaecology in the University of Leeds. He retired from these two posts under the age limit in 1930.

He was a great teacher, and always brimful and overflowing with fresh ideas. When he came in to operate he would suggest problems for investigation as he walked up to the theatre. He was a fine surgeon, equally skilled in the abdominal and vaginal work of his speciality. I remember hearing a well-known Yorkshire surgeon say that Oldfield was the best gynaecologist he had ever seen operate. I unfortunately never saw very much of his work in obstetrics, but in gynaecology his clinical acumen and judgment were outstanding. He lost a little finger in the middle of his career, but this in no way interfered with his manual dexterity and skill. Those who have heard him will readily recall his teaching, speaking in a very quiet voice, with characteristic gestures of the hands. Like all good teachers, he recognized the value of constant repetition. He took up new things with enthusiasm. When, rather belatedly, the British Schools took up treatment by radium in the late twenties, he at once made the new subject one of his chief interests. His best known contributions to medical

CARLTON OLDFIELD

UNIV. OF MICH.

literature were perhaps that on the pernicious vomiting of pregnancy, in the approach to which he was one of the first and one of the most persistent to stress the psychological element, and that on puerperal general peritonitis, in which he was a firm advocate of the benefits of drainage. He was recognized as an exceptionally skilful obstetrician, and so was fittingly chosen to revise the last two editions of that obstetric classic, Herman's "Difficult Labour."

He had many interests outside medicine, notably hunting, farming and golf. In connexion with golf one may allude to his friendship with Lord Moynihan. Donald Bateman—in Moynihan's *Life*—tells of an occasion on which the two were accompanied on their round by a fellow doctor, who remarked that they did a good deal of talking. Moynihan replied "Oh, yes, you mustn't think that we come here just to play golf. We settle the affairs of the universe while we are playing!"

Our sympathy goes out to Mrs. Oldfield and her children in their great loss, and we mourn the passing of a distinguished son of the Leeds School.

ANDREW M. CLAYE.

ROYAL COLLEGE OF OBSTETRICIANS AND GYNAECOLOGISTS

A Meeting of the Council was held on Saturday, May 26th, 1945, in the College House, with the President, Mr. Eardley Holland in the Chair.

The following were formally admitted to the Fellowship by the President:

Caroline Ann Elliott.
Eric Arthur Gerrard.
Robert James Kellar.
Meave Kenny.
Frederick Ross Stansfield.

in absentia:

Geoffrey Shedden Adam.
Arthur Machen Hill.
John Joseph Kearney.
William Keverall McIntyre.
Bruce Toomba Mayes.
Herbert Kenneth Pacey.
Frank Stabler.
Geoffrey Ashburton Thompson.

The following were formally admitted to the Membership by the President:

Amelia Esther Burch.
Eric Garland Collins.
Jadwiga Karnicki.
Gladys Elizabeth Keith.
Dorothea Mary Kerslake.
Dorothy Margaret Shotton.
Benjamin Gibson Gunlys Spiers.

in absentia:

James Paton Orr Erskine.
Andrew Bertram Hay.
Sybil Grace Mocatta.
Dorothy Joan Thompson.

The Annual General Meeting of the College was held on Saturday, May 26th, 1945, in the College House, with the President, Mr. Eardley Holland, in the Chair.

The following were elected to Council in place of those retiring by statutory rotation:

Representative of the Fellows:
Malcolm Donaldson.

Representative of the Members:
Donald Blake Fraser.

The following were re-elected to the Council:

Representatives of the Fellows:
A. M. Claye. C. A. G. Macafee. H. J. Malkin.

Representative of the Members:
Hector Ross MacLennan.

INDEX TO CURRENT LITERATURE

In this Index an endeavour will be made, so far as war conditions permit, to maintain an up-to-date record of all titles bearing on obstetrics and gynaecology and the infant. The classification aims at making immediately available for the reader the titles under the various subject headings. In the majority of instances the title is obtained from the original publication. Where this has been impossible, the title has been obtained from the abstracting journal shown in brackets. Reprints will be welcomed and should be sent to the Editor.

Any inquiries should be addressed to Miss D. F. Atkins, British Post-graduate Medical School, Ducane Road, London, W.12.

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ANATOMY

1. "Study of Bantu female pelvis." O. S. Heyns. *Journ. Anat.*, 1944, LXXVIII, 151–66. (*Brit. Abstr.* A., III, March 1945, 152.)

2. "Studies in X-ray pelvimetry. An evaluation of pelvic radiography, with a plea for simplicity." O. S. Heyns. *Journ. Obstet. and Gynaecol. Brit. Emp.*, April 1945, LII, 148–73.

3. "Vaginal cytology in premature puberty." A. A. Quinet. *An. Brasil Ginec.*, 1944, XVIII, 102. (*Int. Abstr. Surg.*, March 1945, LXXX, 197.)

PHYSIOLOGY

4. "La pretendida diferencia defensiva del peritoneo en los dist ntos sectores del abdomen." (The alleged differential defensive zones of the peritoneal cavity.) C. Stajano. *Obstet. y Ginec. Latin-Amer.*, December 1944, II, 927–40.

5. "The comparative effects of progesterone, estradiol, diethylstilbestrol and its monomethyl ether on the early blastocyst of the rabbit." N. T. Werthessen, S. L. Gargill, S. Berman and B. Greenberg. *Endocrinology*, February 1945, XXXVI, 110–17.

6. "Origin of ova and follicle cells from the germinal epithelium of ovary of albino rat as demonstrated by selective intravital staining with India ink." J. S. Latta and E. S. Pederson. *Anat. Rec.*, 1944, XC, 23–35. (*Brit. Abstr.* A., III, February 1945, 82.)

7. "Development and degeneration of ovum and follicle as observed by intravital staining." E. O. Strassmann. *Amer. Journ. Obstet. and Gynecol.*, March 1945, XLIX, 343–55.

8. "The interrelationship between vitamins B and C and the female sex hormones in their action on the sex organs of the ovariectomized rat." V. Korenchevsky and K. Hall. *Journ. Path. and Bact.*, January 1945, LVII, 141–3.

9. "Ovarian stimulation by oestrogens. II. Stimulation in the absence of hypophysis, uterus and adrenal glands." P. C. Williams. *Journ. Endocrinology*, January 1945, IV, 125–6.

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11. "Induction of heat in spayed female guinea pigs by subcutaneous hormonal implants." P. Bacsich and G. M. Wyburn. *Nature*, April 7th, 1945, CLV, 430.

12. "The role of the thyroid gland and oestrogen in the regulation of gonadotrophic activity of the anterior pituitary." J. P. Chu and S. S. You. *Journ. Endocrinology*, January 1945, IV, 115–24.

13. "The relationship of the normal and hyperactive ovary to menstruation and to endometrial hyperplasia." C. G. Hartman. *Journ. Clin. Endocrinology*, February 1945, V, 99–106.

14. "The basal metabolic rate of the American negro, with particular reference to the effect of menstruation on the female." U. S. Maxwell and G. Wakeham. *Journ. Nutrition*, April 1945, XXIX, 223–7.

15. Interprétation des cycles dits 'anovulaires' chez la femme." (Interpretation of "anovular" cycles in women.) G. Dubreuil. *Gynéc. et Obstét.*, 1944/5, XLIV, 61–5.

16. "Time relationships of deciduomata formation in prolactin-treated and normal pseudopregnant rats." K. L. Sydnor. *Endocrinology*, February 1945, XXXVI, 88–91.

17. "The action of some spasmolytic substances on uterine motility." G. Lehmann. *Journ. Exper. Pharm. and Therap.*, January 1945, LXXXIII, 86–9.

PREGNANCY

General

18. "Obstetrics and gynaecology. Critical review." A. Leyland Robinson. *Brit. Encyclopaedia of Medical Practice, Medical Progress*, 1945, 16–24.

NORMAL

Physiology

19. "The influence of the thyroid on pregnancy and parturition in the rabbit." J. P. Chu. *Journ. Endocrinology*, January 1945, IV, 109–14.

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23. "Limitations of the correlation between the red cell volume and hemoglobin of blood during pregnancy." J. W. Mull. *Journ. Lab. and Clin. Med.*, March 1945, XXX, 278–9.

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25. "Vaginal cornification phases during pregnancy—their prognostic significance." G. J. Hall. *Journ. Clin. Endocrinology*, January 1945, V, 34–7.

26. "La fisiologia de la placenta." (Physiology of the placenta.) L. P. Casanova. *Rev. españ. Obstet. y Ginec.*, February 1945, II, 89–98.

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Diagnosis.

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Antenatal care, examination.

31. "A negro demonstration center for maternal and newborn care in Alabama." T. M. Boulware, E. LaForge and R. C. Stewart. *Southern Med. Journ.*, December 1943, XXXVI, 784. (*Amer. Journ. Dis. Childr.*, March 1945, LXIX, 182.)

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33. "À propos de quelques attitudes de déflexion foetale *in utero*." (Some abnormal positions of the foetus *in utero*.) J. Grasset. *Soc. Gynéc. Obstét.*, Paris, March 1944. (*Gynéc. et Obstét.*, 1944, XLIV, 35–8.)

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Nutrition

34. "Importance of adequate protein nutrition in pregnancy." P. F. Williams. *Journ. Amer. Med. Assoc.*, April 21st, 1945, CXXVII, 1052–5.

35. "Ascorbic acid content of liver in pregnant mice." E. L. Kennaway and N. M. Kennaway. *Cancer Res.*, 1944, IV, 704–6. (*Brit. Abstr.* A., III, February 1945, 105.)

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ABNORMAL

Toxaemias

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42. "Placenta praevia: report of 170 cases." J. T. Persall and R. Torpin. *Journ. Med. Assoc., Georgia*, 1944, XXXJII, 297. (*Int. Abstr. Surg.*, April 1945, LXXX, 275.)

43. "Intravenous pentothal in placenta praevia" (letters). *Brit. Med. Journ.*, 1945, I. J. Campbell May 5th, 642: S. J. Cameron, May 19th, 713.

44. "Intrasternal infusions in obstetrical hemorrhage." M. D. Schnall and R. J. Heffernan. *Amer. Journ. Surg.*, April 1945, LXVIII, 44–8.

Abortion

45. "Rh factor and repeated abortions." A. Bertrand. *Rev. Canad. Biol.*, 1943, II, 541–2. (*Brit. Abstr.*, A III, February 1945, 86.)

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49. "Vaginal bleeding from potassium permanganate as an abortifacient." J. F. McDonough. *New England Journ. Med.*, February 15th, 1945, CCXXXII, 189–90.

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51. "Unusual sequel to attempted criminal abortion." E. J. Bateman. *Amer. Journ. Obstet. and Gynecol.*, February 1945, XLIX, 280–2.

52. "Doit-on réhabiliter la fistulisation intestinal au cours du traitement des péritonites post-abortives?" (Should intestinal fistulae be repaired during the treatment of peritonitis following abortion?) J. Bret. *Soc. Gynéc. Obstét.*, Paris, April 1944. (*Gynéc. et Obstét.*, 1944/5, XLIV, 81–3.)

53. "Trois cas de tétanos post-abortum consecutifs a l'emploi à crayon Chaumel comme agent abortif." (Three cases of tetanus following the use of a Chaumel pencil to procure abortion.) Cleisz, Bret, Gadras and Vallin. *Soc. Gynéc. Obstét.*, Paris, May 1944. (*Gynéc. et Obstét.*, 1944/5, XLIV, 89–91.)

See also Ref. 284.

Association with disturbances of other maternal systems

54. "Surgical complications during pregnancy and labor." W. A. Scott. *Amer. Journ. Obstet. and Gynecol.*, April 1945, XLIX, 494–507.

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56. "Chronic appendicitis and pregnancy." A. S. Coatz. *Semaña Méd.*, 1944, LI, 370. (*Amer. Journ. Obstet. and Gynecol.*, March 1945, XLIX, 448.)

57. "Myelogenous leukaemia and pregnancy. A report of 2 cases." F. T. Miles and D. Wheeler. *Canad. Med. Assoc. Journ.*, April 1945, LII, 407-8.

58. "Dos casos de nanismo con escoliosis vertebral." (Two cases of rickets with scoliosis (associated with pregnancy).) D. D. Cueva. *Obstet. y. Ginec. Latin-Amer.*, January 1945, III, 48–52.

59. "Urological problems in obstetrics and gynaecology." E. von Graff. *Urol. and Cutan. Rev.*, September 1944, XLVIII, 421–3. (*Brit. Journ. Urol.*, March 1945, XVII, 33.)

60. "Pregnancy complicated by Addison's disease." D. E. Sheldon. *Amer. Journ. Obstet. and Gynecol.*, February 1945, XLIX, 269–72.

61. "An analysis of the effects of continued thiourea treatment in pregnancy and on the development of the offspring in the rat." E. D. Goldsmith, A. S. Gordon and H. A. Charipper. *Amer. Journ. Obstet. and Gynecol.*, February 1945, XLIX, 197–206.

62. "Hirsutism in pregnancy." F. J. Stoddard. *Amer. Journ. Obstet. and Gynecol.*, March 1945, XLIX, 417–22.

See also Ref. 287, 290.

Association with infections

63. "Neisserian infection in pregnancy." P. M. Rice. *Amer. Journ. Obstet. and Gynecol.*, February 1945, XLIX, 226–35.

64. "Poliomyelitis in pregnancy." M. J. Fox and L. Sennett. *Amer. Journ. Med. Sci.*, March 1945, CCIX, 382–7.

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